VIRTUAL EVENT

Adv. Materials Science 2024

6TH EDITION OF ADVANCED MATERIALS SCIENCE WORLD CONGRESS

MARCH 21-22, 2024

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ADV. MATERIALS SCIENCE 2024

DAY 1
MARCH 21, 2024

Scientific Program

GMT - Greenwich Mean time (UK Time)

07:45-08:00	**Opening Ceremony**

Topics: Materials Science and Engineering | Nanomaterials and Nanotechnology | Smart Materials | Biomaterials | Energy Materials | Crystallography | Graphene Technology | Chemistry | Carbon and 2D Materials | Semiconductors | Optics | Green Technologies | Metals and Alloys | Perovskites | Artificial Intelligence | Robotics | Catalysis

Distinguished Speaker Talks

08:00-08:20	**Title: Epoxy-based hybrid nanocomposites with nickel zinc ferrite nanoparticles and graphene nanoplatelets for advanced applications** **Sahrim Ahmad,** *University Kebangsaan, Malaysia*
08:20-08:40	**Title: Piezo-phototronic effect in multi-layer structured optoelectronic: Bilateral piezoelectric charge modulation** **Wenbo Peng,** *Xi'an Jiaotong University, China*
08:40-09:00	**Title: Investigation of Runx1 as a potential therapeutic target for cerebral infarction** **Weihong He,** *Sichuan University, China*
09:00-09:20	**Title: Precise damage segmentation in infrastructure surface using fine-tuning U-Net based-deep learning** **Ching-Lung Fan,** *the Republic of China Military Academy, Taiwan*
09:20-09:40	**Title: Band-gap and surface modifications of TiO2 for photocatalytic decompositions under visible light** **Abdul Wafi,** *National Research and Innovation Agency(BRIN), Indonesia*
09:40- 10:00	**Title: Modeling and simulation of Triple Metal Gate Junctionless Ferroelectric (TMGJFe) FET for enhanced analog performance** **Jasdeep Kaur Dhanoa,** *Indira Gandhi Delhi Technical University for Women, India*

Refreshment Break 10:00-10:15

10:15-10:35	**Title: Spectroscopic/colorimetric dual-mode rapid and ultrasensitive detection of reactive oxygen species based on shape-dependent silver nanostructures** **Varsha Usha Vipinachandran,** *Vellore Institute of Technology, India*
10:35-10:55	**Title: Decision making in a complex environment based on cognitive layers** **Sadegh Banitalebi,** *Imam Hossein University, Iran*
10:55-11:15	**Title: The effect of ferrite bead on conducted emission in an automotive LED driver module with DC-DC converters** **Oğuzhan Coşkun,** *Bursa Uludag University, Turkey*
11:15-11:45	**Title: Degradation evaluation of pressboard insulation of converter transformer by applying FDS and digital image processing tool** **Anjali S. Bhalchandra,** *Government College of Engineering, Aurangabad, India* **Shrikant S. Mopari,** *Government College of Engineering, Aurangabad, India*
11:45-12:05	**Title: Measuring mechanical stresses using acoustoelasticity** **Auteliano Antunes dos Santos Junior,** *Universidade Estadual de Campinas, Brazil*
12:05-12:25	**Title: Elimination of secondary oxide phases in CdTe nanostructured thin films prepared by conventional spray pyrolysis, and the influence of thermal annealing** **Hossein Robatjazi,** *Shahrood University of Technology, Iran*

Lunch Break 12:25-13:00

13:00-13:20	**Title: Conjugated oligomers with Hetero-rings to improve photovoltaic performance** **Ouafae Ninis,** *Abdelmalek Essaadi University, Morocco*
13:20-13:40	**Title: Formation of a solid solution in a polycrystalline Sc_2O_3 upon irradiation with xenon ions with energies of 140 and 300 keV** **Alexandra Solovyeva,** *Physico-Technical Institute in Sukhum, Republic of Abkhazia*

13:40-14:00	**Title: Application of reflecting coating on a building's roof thermal performance- A review** **Wurood Asaad Midab,** *Ministry of Electricity, Iraq*
14:00-14:20	**Title: Smart nanocomposites of conjugated polymers for sensing applications** **Alexander Pud,** *NAS of Ukraine, Ukraine*
14:20-14:40	**Title: Microstructure, mechanical and corrosion properties of anodized ultrafine-grained titanium based materials for medical application** **Dragana R. Mihajlović,** *University of Belgrade, Serbia*
14:40-15:00	**Title: Novel approach to assess seawater breakthrough using FTIR spectroscopy** **Hauwa Abubakar Rasheed,** *Nile University of Nigeria, Nigeria*

Refreshment Break 15:00-15:15

15:15-15:35	**Title: Green particle board production from Agro-forest residue valorization** **Prosper Mensah,** *CSIR-Forestry Research Institute of Ghana, Ghana*
15:35-15:55	**Title: Quantum correlations in two interacting spins under thermal effect** **Mouhcine Yachi,** *Chouaib Doukkali University, Morocco*
15:55-16:15	**Title: Comparative study on industrial processabilities of cellulosic raw materials for eco-friendly textile production** **Most Kaniz Moriam,** *Massachusetts Institute of Technology, USA*

Closing Remarks

End of Day 1

DAY 2
MARCH 22, 2024

Scientific Program

GMT - Greenwich Mean time (UK Time)

08:45-09:00	**Introduction**

Topics: Materials Science and Engineering | Nanomaterials and Nanotechnology | Smart Materials | Biomaterials | Energy Materials | Crystallography | Graphene Technology | Chemistry | Carbon and 2D Materials | Semiconductors | Optics | Green Technologies | Metals and Alloys | Perovskites | Artificial Intelligence | Robotics | Catalysis

Distinguished Speaker Talks

09:00-09:20	**Title: Two-stage cultivation as effective strategy for enhanced productivity in plant and microalgal cell culture systems** **Mohd Azmuddin Abdullah,** *SIBCo Medical and Pharmaceuticals Sdn. Bhd., Malaysia*
09:20-09:40	**Title: Hypoxic bone mesenchymal stem cell-derived exosomes direct Schwann cells proliferation, migration, and paracrine to accelerate nerve regeneration *via* circRNA_Nkd2/miR-214-3p/MED19 axis** **Haopeng Wang,** *Shanghai Jiaotong University School of Medicine Xinhua Hospital, China*
09:40-10:00	**Title: Video steganalysis system for the cross domain steganography** **Surendra Bhosale,** *Veermata Jijabai Technological Institute, India*
10:00-10:20	**Title: Synthesis of novel vicinal diaryl triazoles with sulfur and hydrazine linkers as highly potent anticancer and antioxidant agents** **Seyedeh Mahdieh Hashemi,** *Mazandaran University of Medical Sciences, Iran*
10:20-10:40	**Title: Collocation method for fuzzy fractional integro-differential equations** **Suvankar Biswas,** *Indira Gandhi National Open University, India*
10:40- 11:00	**Title: Role of metal-polymer hybrid composites as fillers for reinforcement of epoxy resin and improving its properties** **Ramya Rajan,** *Amrita Vishwa Vidyapeetham, India*

Refreshment Break 11:00-11:15

11:15-11:35	**Title: Energy harvesting by cyclic tensile loading and buckling *via* an electrospun polyblend elastic layer of PVDF/PU** **Behrang Adeli,** *Amirkabir University of Technology, Iran*
11:35-11:55	**Title: Modelling of corrosion rate in the drinking water distribution network using Design Expert 13 software** **Reena Singh,** *National Institute of Technology Patna, India*
11:55-12:15	**Title: Sol-gel synthesis, characterization and luminescence investigation of trivalent rare earth doped garnet phosphor** **Anita Verma,** *Kalinga University, India*
12:15-12:35	**Title: Ethylene-alpha olefin elastomers: Liquid phase catalyst active center residential environment and copolymerization microkinetics** **Muhammad Atiqullah,** *Research Institute King Fahd University of Petroleum & Minerals, Saudi Arabia*
12:35-12:55	**Title: Propagation impairment in free space Terahertz communication at sub-tropical territories** **Debraj Chakraborty,** *Swami Vivekananda University, India*
12:55-13:15	**Title: The nucleation of crystals in volcanic glass** **Galina Aleksandrovna Sycheva,** *Grebenshchikov Institute of Silicate Chemistry, Russian Academy of Sciences, Russia*
13:15-13:35	**Title: Effect of printing parameters on the mechanical properties and energy absorption characteristics of 3D printed specimen from Polylactic Acid (PLA) filament** **Oluwaseun Kayode Ajayi,** *Obafemi Awolowo University, Nigeria*

Closing Remarks

End of the Conference

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DISTINGUISHED SPEAKER TALKS

DAY 1

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Epoxy-based hybrid nanocomposites with nickel zinc ferrite nanoparticles and graphene nanoplatelets for advanced applications

Sahrim Ahmad

School of Applied Physics, Faculty Science and Technology, University Kebangsaan, Malaysia

Epoxy is a synthetic polymer material extensively utilized in composite manufacturing due to its favorable mechanical, thermal, chemical, and corrosion-resistant characteristics. However, its inherent brittleness and low fracture toughness impose limitations on its applications. To address these concerns, the incorporation of liquid epoxidized natural rubber (LENR) has been explored to enhance epoxy resin's toughness and overall strength. The impact of adding liquid epoxidized natural rubber (LENR) to epoxy has revealed that optimal mechanical strength is achieved at a 3%wt LENR content. It's worth noting that LENR does influence the crystallization rate of epoxy resin. This study aims to develop and characterize nanocomposite materials that incorporate rubber toughening, alongside nickel-zinc (NiZn) ferrite and graphene nanoplatelet (GNP) fillers. The goal is to investigate their mechanical, thermal, and electrical properties, in comparison to the composite comprising epoxy/LENR alone. The introduction of these nanoparticles has significantly enhanced the mechanical properties of the composites even at low filler loadings. Notably, the mechanical strength of epoxy/LENR/NiZn ferrite nanocomposites exhibited improvement with the addition of NiZn ferrite. Experimental analyses indicate that the optimal strength is achieved at 4%wt NiZn ferrite and 0.6%wt GNP. Moreover, these nanocomposites demonstrate improved thermal stability across the board. Electrically, the epoxy/LENR/GNP-NiZn ferrite composite exhibited superior conductivity compared to both epoxy/LENR/NiZn ferrite and epoxy/LENR/GNP composites. Intriguingly, all nanocomposites induced a transition from insulating properties to that of a semi-conductor in the presence of 4%wt NiZn ferrite, 0.4%wt GNP, and the various hybrid combinations of GNP-NiZn ferrite. The results indicated an increased magnetic interaction within the nanocomposites upon NiZn ferrite incorporation. This heightened interaction can be attributed to the direct proportionality between the saturation magnetization (MS), remanence magnetization (MR), and the magnetic particle composition within the epoxy matrix. While Fourier-

transform infrared spectroscopy (FTIR) analysis revealed no discernible chemical changes due to the inclusion of NiZn ferrite and GNP, alterations were observed in absorption peak intensities. X-ray diffraction (XRD) analysis highlighted an accelerated crystallization rate facilitated by the presence of nanoparticles in the epoxy/LENR matrix. SEM micrograph has shown a homogeneous dispersion of NiZn ferrite within the epoxy/LENR blend. Overall, the hybridization approach has effectively elevated the mechanical, thermal, electrical, and magnetic properties of the resulting nanocomposites. This hybrid nanocomposites are potential to be applied as EMI shielding and radar absorbing materials (RAM).

Biography

Professor Dr. Sahrim Ahmad obtained his PhD from the University of Loughborough, United Kingdom, in 1988. He holds expertise in the domains of magnetism, nanocomposites, and advanced materials. Throughout his career, he has spearheaded over 55 research projects and consulting assignments, both as a principal investigator and a collaborative researcher. His pioneering work in the realm of novel radar absorbing materials (RAM), particularly in the context of transverse electromagnetic (TEM) applications, has yielded remarkable results. The outcomes of his endeavors include the successful development of products characterized by optimal attributes such as malleability, adaptability, and lightweight properties. These products seamlessly align with the diverse demands of various applications. Dr. Sahrim's scholarly contributions extend to the publication of more than 250 papers across a range of esteemed journals. Furthermore, his mentorship has nurtured the academic growth of over 60 PhD students under his guidance. Driven by his commitment to academic leadership, he previously served as the Dean of the Faculty of Science and Technology. Notably, he also assumed the role of Editor- in-Chief for the esteemed Journal Sains Malaysiana (indexed in ISI/WOS), showcasing his dedication to advancing scientific discourse.

Piezo-phototronic effect in multi-layer structured optoelectronic: Bilateral piezoelectric charge modulation

Wenbo Peng[1,2] and **Fangpei Li**[1,2]

[1]School of Microelectronics, Xi'an Jiaotong University, China
[2]The Key Lab of Micro-Nano Electronics and System Integration of Xi'an City, China

Piezo-phototronic effect utilizes the strain induced piezoelectric charges inside the piezoelectric semiconductors to modulate the local energy band diagram at the interface of junctions, thus controlling the photo-generated carriers' behaviors and the performance of optoelectronic devices. Since its invention in 2010, piezo-phototronic effect is vastly demonstrated in photodetectors, light-emitting diodes, and solar cells, where only one interface is modulated by piezoelectric charges. In 2018, we first propose to construct multi-layered structure for efficient utilization of piezoelectric charges with both polarities and obtain better performance optimization by piezo-phototronic effect [1], which we recently name as *Bilateral Piezoelectric Charge Modulation* [2]. Here, we summarize the recent progresses of our researches on bilateral piezoelectric charge modulation, including both experimental results and analytical theories.

An n-ZnO/p-Si/n-ZnO double heterojunction bipolar phototransistor is designed, and the regulation of bilateral piezoelectric charges on bipolar phototransistor's performances is studied from the perspectives of theoretical derivation and experimental research simultaneously. A theoretical model of n-ZnO/p-Si/n-ZnO double heterojunction bipolar phototransistor is established, and the influence of four polar combinations of piezoelectric charges induced by different strains formed at the interface of two heterojunctions on the characteristics of phototransistor is carefully studied. The theoretical calculation results show that, when positive piezoelectric charges are generated at both two interfaces, the regulation of strain on the phototransistor is a superposition of two positive effects, which can significantly improve the performances of phototransistor. Then an n-ZnO/p-Si/n-ZnO double heterojunction bipolar phototransistor is experimentally prepared. By rationally designing the device structure, positive piezoelectric charges could be simultaneously generated at the two heterojunction interfaces when an external compressive strain is applied. The saturation current of phototransistor is significantly improved, and the photoresponsivity is also improved to a certain extent by the applied compressive strain. To further optimize the performances, the effects of interdigitated electrode's size, substrate and ZnO layer on the strain regulation of device performance are carefully studied. The experimental results show that when the p-Si substrate is used, the size of interdigitated electrodes is chosen as channel width W_0 = 80 μm, the channel length L = 5 μm, and the number of electrodes N = 14, and the ZnO nanowires layer prepared by low temperature hydrothermal growth method is used as both emitter and collector, the strain induced bilateral piezoelectric charges regulation of the obtained bipolar phototransistor is the best. At a compressive strain of -1.37%, the photoresponsivity is enhanced about 2000%, indicating the significant modulation of applied strain on the performances of heterojunction bipolar phototransistor.

Biography

Dr. Wenbo Peng is now an Associate Professor at School of Microelectronics, Xi'an Jiaotong University. He received his PhD degree in major of Electronic Science and Technology at 2016 and bachelor degree in major of Microelectronics at 2010, from Xi'an Jiaotong University. He has been a visiting scholar in School of Materials Science and Engineering, Georgia Institute of Technology from Aug 2014 to Jul 2016, working on the research fields of piezotronics and piezo-phototronics under the supervision of Prof. Zhong Lin Wang.

His research interests mainly focus on advanced low dimensional piezoelectric semiconductor materials, devices and physics, and novel intelligent sensing integrated chips. He has received several fundings from NSFC, Shaanxi Province and companies. He has authored and co-authored over 50 peer-reviewed journal publications in related research fields, parts of which are published on high quality international journals, including Advanced Materials, Advanced Functional Materials, Advanced Energy Materials, Nano Energy, ACS Nano, Nano Letters, etc. His publications have been cited over 2400 times, as documented at Google Scholar (h-index: 26). He has given several Keynote/Distinguished/Invited Talks in renowned international conferences. He is the Fellow of International Association of Advanced Materials.

Investigation of Runx1 as a potential therapeutic target for cerebral infarction

Weihong He[3], **Hengshu Chen**[1], **Xin Zan**[2], **Yanan Wang**[1], **Xing Hua**[1], **Meng Liu**[1] and **Simiao Wu**[1]

[1]Department of Neurology, West China Hospital, Sichuan University, China
[2]Department of Neurosurgery, West China Hospital, Sichuan University, China
[3]Department of Physiology, West China School of Basic Medical Sciences and Forensic Medicine, Sichuan University, China

Stroke, also known as cerebral infarction, is the second leading cause of death in the world and the leading cause of death in China. The high mortality and morbidity of stroke result in immense public healthcare burden with serious socioeconomic consequences. Since no existing treatment can consistently mitigate the effects of stroke, new therapeutic targets and new effective drugs are urgently needed to improve the outcomes of stroke treatment. Runt-related transcription factor-1 (RUNX1), a member of the core-binding factor family of transcription factors, is classically considered the master regulator of developmental hematopoiesis because of its important role in the specification of the hematopoietic lineage during embryogenesis. Whilst the focus of RUNX1 research has predominately been in the hematopoietic field, recent evidence reveals emerging functions of RUNX1 in different tissues under pathological conditions. Dr. He's previous study on myocardial infarction (MI) performed with a cardiomyocyte-specific Runx1-deficient mouse shown that RUNX1 has a critical role in cardiomyocytes after MI and in the *in vivo* mouse MI model reducing RUNX1 expression preserves cardiac contractile function and prevents adverse cardiac remodeling. Importantly, RUNX1 can be pharmacologically inhibited by its chemical inhibitors and thus can be tested as a potential druggable target in a range of pathological contexts. However, the expression pattern and functional roles of RUNX1 in the brain after cerebral infarction are unknown. In the present study, we have established a rat model of middle cerebral artery occlusion (MCAO). Rats were subjected to MCAO by means of surgically inserting a monofilament into the middle cerebral artery. RUNX1 expression level and infarct size were assessed. We demonstrate for the first time that RUNX1 expression is increased in the brain after MCAO, and interestingly the increased RUNX1 expression is associated with increased infarct size. Our results suggest that understanding of the role of RUNX1 in the brain could contribute to potential therapeutic strategies for cerebral infarction. Our on-going study seeks to investigate whether the increased expression of RUNX1 in the brain can be therapeutically targeted to protect brain after stroke.

Biography

Weihong He is a principal investigator and associate professor at the Department of Physiology, West China School of Basic Medical Sciences and Forensic Medicine, Sichuan University. Weihong obtained a MD (2012) at West China School of Medicine & West China Hospital, Sichuan University, and completed a PhD (2017) at the BHF Glasgow Cardiovascular Research Centre, University of Glasgow. Weihong was associate professor at Jining Medical University (2018-2020). Since 2020, Weihong has led a research group to study the pathophysiology of cardiovascular diseases and to investigate novel therapeutic drugs for the treatment of myocardial infarction and cerebral infarction at Sichuan University. He also teaches physiology and mentors both national and international students. Weihong has expertise in a number of methodologies which span the level of biochemistry, cell biology, isolated organ, and whole animal *in vivo* disease models.

VIRTUAL EVENT

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Precise damage segmentation in infrastructure surface using fine-tuning U-Net based-deep learning

Ching-Lung Fan

Department of Civil Engineering, the Republic of China Military Academy, Taiwan

In this paper, we propose the utilization of Fine-tuning U-Net for the precise segmentation of damage in infrastructure surfaces. U-Net, a specialized variant of Convolutional Neural Networks (CNNs), excels at extracting distinctive features indicative of damage from images. Our approach focuses on the classification and segmentation of exposed rebar and spalling, two critical types of damage in infrastructure structures. To fully unleash the potential of U-Net in image analysis, we meticulously fine-tune its network architecture and hyperparameters. Our experiments yield a remarkable damage segmentation accuracy of 82%, and importantly, our model exhibits no signs of overfitting. These promising results underscore the potential of deep learning techniques, specifically tailored to damage image analysis, in providing invaluable insights for inspectors regarding the severity of identified damages.

Introduction: The detection of damage on infrastructure surfaces is of paramount importance for maintenance and safety. In recent years, the emergence and advancement of deep learning methodologies have revolutionized image recognition, making them a highly promising solution for the precise identification of infrastructure damage. In this paper, we present a novel application of Fine-tuning U-Net for the segmentation of infrastructure damage, leveraging visual data obtained from damaged surfaces. Our proposed method excels in extracting subtle yet critical features indicative of damage from images. The dataset employed in our study comprises high-resolution images captured using a smartphone, with a resolution of 3,264×2,448 pixels. To fully harness the potential of U-Net for effective training and testing on this dataset, we meticulously fine-tuned the network architecture and hyperparameters. Fig. 1 illustrates the architecture of the Fine-tuning U-Net model, specifically tailored for this study.

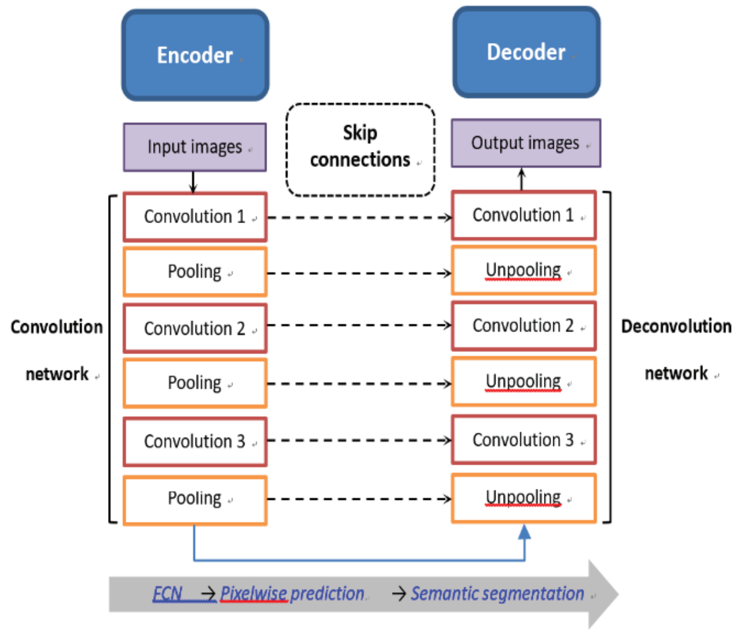

Fig. 1 U-Net architecture of the semantic segmentation

Results: Fig. 2 and Table 1 showcase the outcomes of Fine-tuning U-Net for damage detection on infrastructure surfaces. The segmentation accuracy achieved by the Fine-tuning U-Net model is an impressive 82%, and we are pleased to report that the model exhibits no overfitting. Notably, our approach successfully classifies and segments exposed rebar, spalling, and undamaged areas in the infrastructures. This section delves deeper into a discussion of the results, exploring the implications of our findings for the field of infrastructure surface inspection and maintenance. We compare our approach with existing methods, highlighting the advantages of employing deep learning techniques for damage assessment. Additionally, we address potential limitations and suggest avenues for future research, such as expanding the dataset or optimizing computational resources.

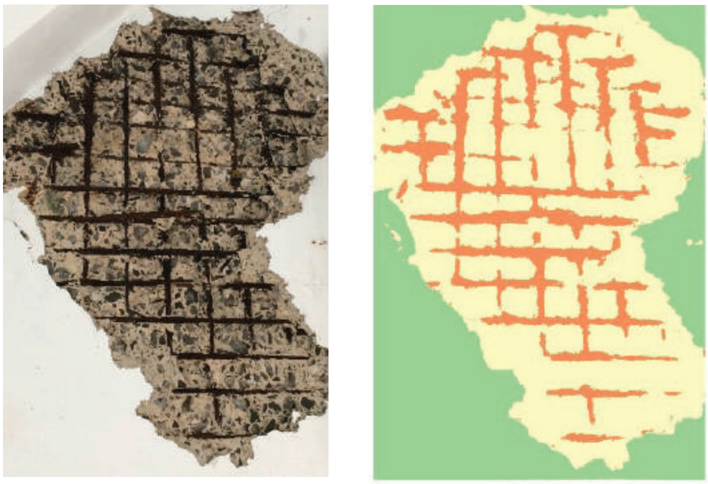

Fig. 2 Damage of segmentation results for the infrastructure

Index(%)	Rebar	Spalling	Undamage
Precision	70.76	74.19	96.53
Recall	63.97	73.07	95.92
F1	67.19	73.62	96.22
Accuracy	82		

Table 1. Performance evaluation results of Fine-tuning U-Net

This study underscores the exceptional adaptability of deep learning techniques tailored to the analysis of damage images. Our application of Fine-tuning U-Net for damage detection on infrastructure surfaces holds great promise for practical applications in the realms of building maintenance and safety. The remarkable segmentation accuracy achieved by our Fine-tuning U-Net model, coupled with its robustness against overfitting, highlights the potential for automated inspection systems to provide inspectors with invaluable insights into the severity of identified damages

Biography

Ching-Lung Fan, Ph.D., is an associate professor at the Republic of China Military Academy, specializing in machine learning, deep learning, data mining, and construction performance and risk management. In 2019, he earned a Ph.D. from the National Kaohsiung University of Science and Technology. Dr. Fan received the Phi Tau Phi Scholastic Honor Society award and was honored for outstanding papers at the 25th Symposium on Construction Engineering and Management/International Conference on Big Data, Sensing, and Machine Learning (2021) and the 34th Conference on Military Engineering (2022). In 2023, he joined Sigma Xi, The Scientific Research Honor Society.

Band-gap and surface modifications of TiO_2 for photocatalytic decompositions under visible light

A. Wafi[1], **L. Roza**[1], **G.E. Timuda**[1], **E. Szabó-Bárdos**[2] and **O. Horváth**[2]

[1]Research Center for Advanced Materials,
National Research and Innovation Agency (BRIN), Indonesia
[2]Research Group of Environmental and Inorganic Photochemistry,
Center for Natural Sciences, University of Pannonia, Hungary

Heterogeneous photocatalysis has been an intensively investigated in the field of science for decades. The band gap of TiO_2 is rather wide (3.2 eV), therefore titanium dioxide can utilize only a small part of the sunlight's energy. However, there is an increasing demand for extending the sensitivity of this catalyst towards the visible-light region.

Doping TiO_2 with nitrogen is a widespread technique to create defects in the crystal lattice, thus reducing the band-gap energy and shifting the absorption into visible region. In addition, the surface modification with noble metal such Ag also demonstrated an ideal strategy to enhance the visible-light absorption via surface plasmon resonance (SPR).

In this work, nitrogen-doped TiO_2 catalysts with hollow (h-N-TiO_2) and non-hollow (nh-N-TiO_2) structures were synthesized by co-precipitation and sol-gel methods. Different approaches, such as nitrogen source and concentration, temperature of the synthesis, calcination time and temperature were tested to examine the optimum outcome regarding photoactivity. Furthermore, Ag nanoparticles were successfully loaded on the surface of N-TiO_2 by using photo-deposition technique.

The photocatalytic performance of the catalysts was examined with coumarin and 1,4-hydroquinone. The results showed that surface structure, crystallinity, nitrogen content, and specific surface area were found to be crucial features in the photocatalytic performance of the catalysts. Due to its hollow structure and larger specific surface area, the photoactivity of h-N-TiO_2 was higher compared to non-hollow nh-N-TiO_2 catalyst.

Furthermore, various silver amounts were successfully loaded on the surface of N-TiO_2 catalysts by using a facile photo-deposition technique. The results exhibited that Ag-loading on the surface of nh-N-TiO_2 could double the photocatalytic performance with an optimum Ag concentration of 10^{-6} mol g^{-1}, while a slight but monotonous decrease was caused in this respect for the h-N-TiO_2 catalyst upon increasing Ag concentration.

Biography

Abdul Wafi, a global citizenship from Indonesia, Currently, he was a Research Fellow in the Research Center for Advanced Materials, National Research and Innovation Agency of Republic of Indonesia (www.brin.go.id). His research interests are synthesis and characterization of metal-oxide nanomaterial (particularly TiO_2) as a photocatalyst. This material could be applied for water purification, water splitting, carbon capture, etc. The photocatalyst was modified through the surface and band-gap structure in order to enhance its light-harvesting, particularly under solar and visible irradiation as a sustainable energy source and free of charge. He has experienced in several syntheses of nanomaterials and its characterization techniques involved data analyses from FTIR, Raman, XRD, DRS, FESEM, HRTEM, EDS, BET, DTA-TGA, etc. Furthermore, he was also familiar with several analytical measurements including UV-Vis Spectrophotometer, HPLC, Photo-luminescence, TOC Analyzer, etc.

Modeling and simulation of Triple Metal Gate Junctionless Ferroelectric (TMGJFe) FET for enhanced analog performance

Jasdeep Kaur[1], Shalu Garg[1], Anubha Goel[2], Subhasis Haldar[3] and **R.S. Gupta[2]**

[1]Department of Electronics and Communication Engineering
Indira Gandhi Delhi Technical University for Women, India
[2]Department of Electronics and Communication Engineering
Maharaja Agrasen Institute of Technology, India
[3]Department of Physics
Motilal Nehru College University of Delhi, India

In this manuscript, a Triple Metal Gate Junctionless Ferroelectric (TMGJFe) FET with high-K dielectric (HfO_2) has been proposed to examine the analog performance of the device in terms of drain current (I_{ds}), transconductance (gm), and output conductance (g_d). Also, electrical characteristics have been studied. A fair comparison has been done between TMGJFe FET and Double Metal Gate Junctionless Ferrolectric (DMGJFe) FET on the basis of gate controllability and drain derivability. Si:HfO_2 has been implemented as a ferroelectric interface layer. Due to the negative capacitance phenomenon of the ferroelectric layer, subthreshold swing (SS) has been reduced below 60 mV/decade, which increases the switching speed of the device. Hence, a reduction in the threshold voltage occurs. Atlas 3D simulator has been implemented for simulations.

Biography

Dr. Jasdeep Dhanoa, B.E, M.Tech, Ph.D is Professor in the Dept of Electronics and Communication Engineering at IGDTUW, Govt of NCT of Delhi, India. She has served as Dean-Academic (2020-23) and Head of The Department of Electronics & Communication Engineering (2015-18). She is the Training and Placement Officer since 2018. As a IEEE Senior Member & Vice Chair-Delhi section-2023 represented in the Triennial Section Congress-2023 at Ottawa, Canada.

She has publications in International/ National Journals and Conferences and has team of active research scholars. As CI of the SMDP– (Chip to System Design), project of MieTY, Govt of India, has headed the team for fabrication of BGR. In 2019, was selected and participated in the International Visitor Leadership Program, fully sponsored by the USA State Federal Government on "Advancing Women in STEM Fields" from October 7-25, 2019. She is on panel of many Government/NGOs too.

Spectroscopic/colorimetric dual-mode rapid and ultrasensitive detection of reactive oxygen species based on shape-dependent silver nanostructures

Varsha Usha Vipinachandran and **Susanta Kumar Bhunia**

Vellore Institute of Technology, India

Excessive production of reactive oxygen species (ROS) from endogenous and exogenous pathways is linked to oxidative stress and various diseases. Although a variety of ROS probes have been developed, their multistep synthesis strategies and complicated instrumental operating procedures limit their frequent use. In this work, different shaped silver nanostructures including nanoparticles, nanoprisms, and nanocubes were utilized to demonstrate simple spectroscopic and colorimetric techniques for sensitive ROS detection. The nanostructures displayed different sensing behaviours recorded *via* plasmon tuning with morphological changes upon exposure to ROS. Among the nanostructures, silver nanocubes were found to be extremely efficient in recognising a particular ROS, namely hypochlorite ions. The detection limits of this ROS were calculated to be 23.76 nM, 85.71 nM, and 36.37 nM for silver nanoparticles, nanoprisms, and nanocubes, respectively. A time-dependent microscopic examination was carried out and revealed that the presence of hypochlorite ions deteriorates structural morphologies. The formation of highly reactive chlorite, chlorate, and chloride ions in hypochlorite ion solution was ascribed to the significant spectroscopic and microscopic changes in all the nanostructures. The attenuation of plasmonic peaks and etching of nanostructures by ROS were supported by the increment of the oxidation state of silver. In addition, silver nanocubes were successfully applied to recognize ROS in *Spinacia oleracea* and real water samples. The results confirm the potentiality of silver nanostructures for sensitive detection of ROS in biological and environmental systems.

Biography

She was an avid researcher pursuing a PhD at Vellore Institute of Technology under the guidance of Dr. Susanta Kumar Bhunia. She has been working on nanomaterial synthesis and their application for over four years. Expertise in the synthesis and fabrication of nanomaterials like plasmonic materials with various nanostructures, carbon dots, metal-organic frameworks, graphitic carbon nitride, Mxene, treated carbon nanotubes, polycarbosilane-based composites, and reduced graphene oxides for chemical and photocatalytic studies and sensing of toxic chemicals and storage applications. During her master's degree, she worked on rocket coating material based on polycarbo silane and carbon nanotubes for ISRO (Indian Space Research Organization). Currently, nine articles have been published (including reviews) and two more are in the process of being communicated.

Decision making in a complex environment based on cognitive layers

Sadegh Banitalebi

Imam Hossein University, Iran

The concepts of dominating sets and cobondage sets are fundamental concepts in the graph theory and have usages in several fields, particularly in the fields of operations research, neural networks, electrical networks and monitoring communication. dominating sets can play a significant role in recognizing, controlling and optimizing the complex environment. The purpose of this presentation is graph model of decision-making based on factors affecting a control goal. The method we follow to achieve this goal is based on drawing cognitive maps.

Biography

Sadegh Banitalebi a graduate of PhD in mathematics and he was doing research in the field of mathematical modeling, fuzzy mathematics, fuzzy logic and cognitive modeling.

VIRTUAL EVENT
6th Edition of
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March 21-22, 2024

The effect of ferrite bead on conducted emission in an automotive LED driver module with DC-DC converters

Oğuzhan Coşkun[1,2], **Recep Eken**[1,3], **Özgür Çevik**[1,4] and **Güneş Yılmaz**[1]

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[2]EMKO Elektronik A.Ş., Turkey
[3]DAIICHI Elektronik A.Ş., Turkey
[4]FEKA Otomotiv A.Ş., Turkey

Commonly, ferrite beads are used for reducing high-frequency emissions generated by electronic modules. Even though the high impedance attribute of ferrite beads at high frequencies is useful in reducing radiated emissions (RE), their inductive character in the low-frequency region necessitates consideration of conducted emissions (CE). In this research, the behavior of the ferrite bead used for reducing the emissions generated by the LED driver module of the front fog lamp of a passenger vehicle has been experimentally investigated in the low-frequency region. For this purpose, the CE test, which is one of the most crucial electromagnetic compatibility (EMC) tests in the automotive industry, has been performed. Moreover, two different designs of the concerned PCBs have been research and developed. Then, CE tests have been carried out for both designs in a semi-anechoic chamber. Thus, the highest CE values for the model including ferrite bead have been obtained as 82.49 dBμV for 210 kHz but for the model including 0R (zero - ohm) have been acquired as 78.81 dBμV for 182 kHz, respectively. Using empirical results obtained in this research, effect of ferrite bead in the 150 kHz - 108 MHz frequency range has been examined and interpreted with the help of corresponding simulations.

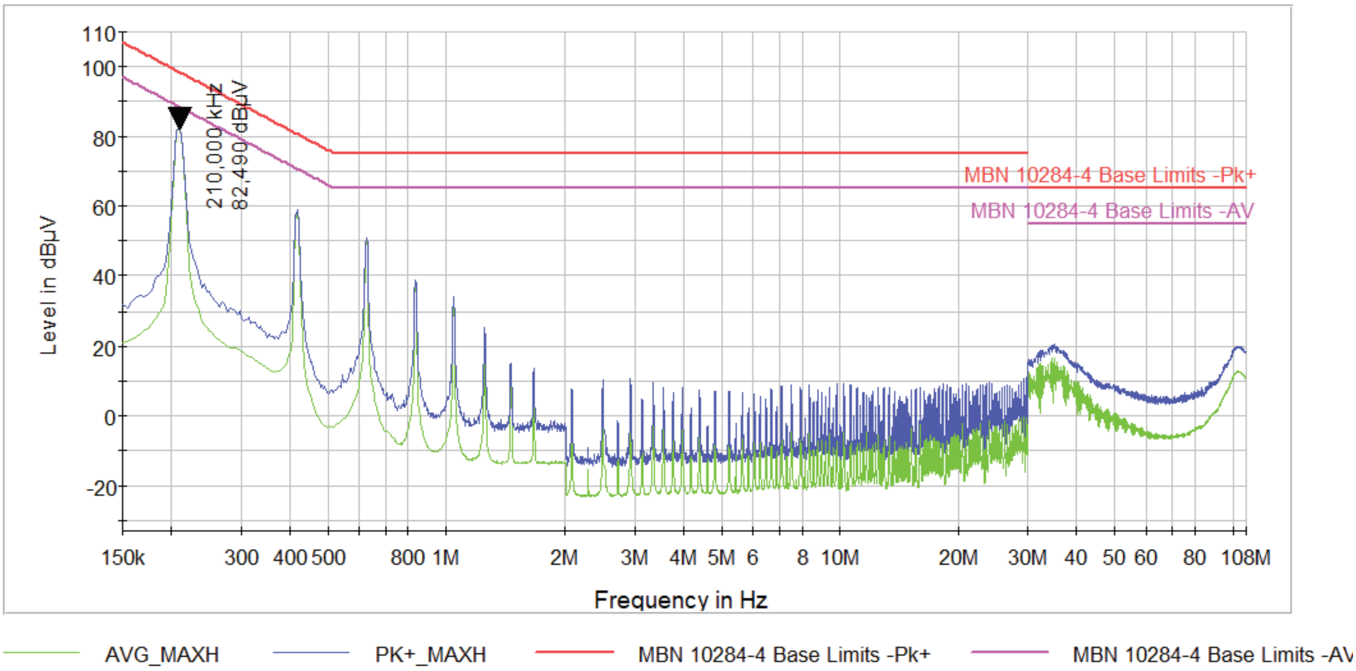

Fig. Conducted emission test results obtained from PCB including ferrite beads.

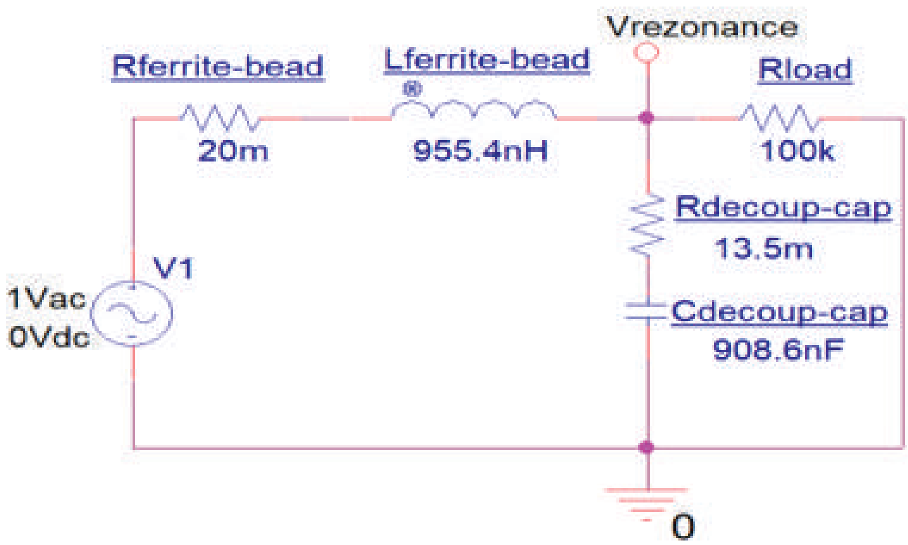

Fig. Series RLC resonant circuit of ferrite bead and decoupling capacitor used in the simulation program.

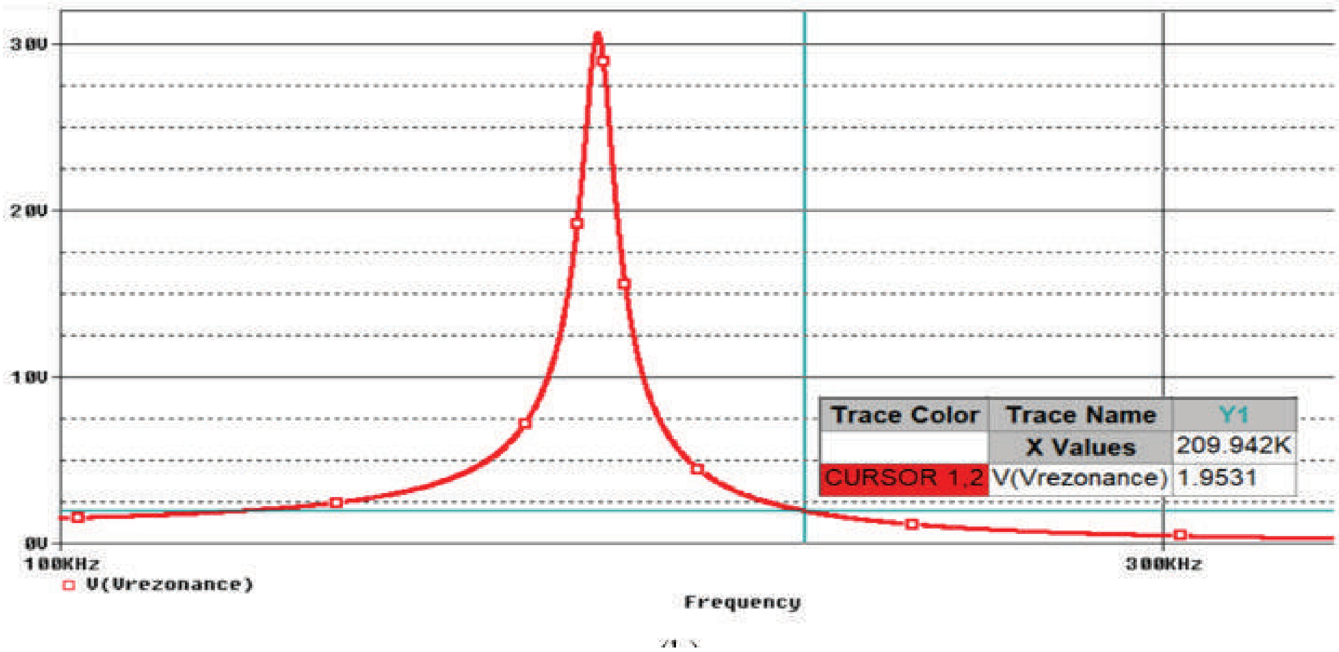

Fig. RLC series resonant circuit simulation results at the switching frequency

Biography

Oğuzhan Coşkun received his bachelor's degree in Electrical and Electronics Engineering from Bolu Abant İzzet Baysal University in 2016. He obtained his Master's degree in the same department at Bolu Abant İzzet Baysal University in 2018. In 2023, he earned his Doctorate degree from Bursa Uludağ University in the field of Electronics Engineering. Furthermore, he has been serving as a researcher/specialist at EMKO Elektronik A.Ş. under the TÜBİTAK 2244 - Industrial PhD Fellowship Program. He is employed as a Senior Electronic Design Engineer at the company. His current research involves EMI reduction in PCBs, PCB modeling, EMC tests, embedded systems, and industrial control and communication cards.

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Degradation evaluation of pressboard insulation of converter transformer by applying FDS and digital image processing tool

A.S. Bhalchandra[1], Shrikant S. Mopari[1], D. S. More[2], Pannala Krishna Murthy[3], K. M. Jadhav[4] and **R C. Kamble[5]**

[1]Electrical Engineering Dept., Government College of Engineering, Aurangabad, India
[2]Electrical Engineering Dept., Walchand College of Engineering, India
[3]Electrical Engineering Dept, Khammam Institute of Technology & Sciences, India
[4]Dept. of Physics, MGM University, India
[5]Dept. of Physics, Savitribai Phule Pune University, India

The reliable operation of power system transmission in the case of high voltage direct current transmission (HVDC) is mainly dependent on the converter transformer and is a challenging task. The smooth operation of the converter transformer is basically dependent upon the inter-turn and inter-disk insulation across the winding.

An attempt is made to examine the effect of the pressboard insulation material under frequency and elevated temperature. In the present study, oil-impregnated pressboard insulation degradation under FDS was studied at temperatures ranging from 30°C to 130°C with an incremental rise of 20°C with frequency variation from 1 Hz to 10 MHz. The various dielectric parameters were measured as a function of elevated temperatures and frequency which show exponentially decreasing nature, while conductivity increases. This confirms the degradation of pressboard insulation. The scanning electron microscopy (SEM) techniques were applied to understand the surface morphological changes inside the pressboard insulation. The fibre width was measured by randomly selecting the average of three local areas of the SEM image which decreases with elevated temperature. Various digital image processing tools were employed to study the pressboard insulation degradation. The canny operator applied for edge detection shows 49.75% and 71.93% changes for 110°C and 130°C as compared to the virgin sample. The porosity and pore size distribution measured using SEM images show increasing trends with elevated temperatures. Using MATLAB Simulink, a single-phase, 315 MVA valve side star winding with 60 discs of single-phase converter transformers model was developed. An impulse of 100 kV, 1.2/50μsec is applied across the star winding of the converter transformer and the pressboard insulation degradation can analysed based on FDS data with the help of mathematical morphology and wavelet transform technique. During the impulse test, the neutral current is captured and the energy of the wavelet coefficients suggests a considerable contribution to analyzing the pressboard insulation degradation of the converter transformer across the winding. This result provides early detection of degradation of pressboard insulation which will be helpful in reducing the outage time of the converter transformer during operating conditions.

Biography

Shrikant S. Mopari

He is currently working toward a Ph.D. degree in the Department of Electrical Engineering, Walchand College of Engineering, Sangli, India. He had a teaching experience of 20 years and 1 year of industrial experience. In 2010, he joined the Government College of Engineering, Chh. Sambhajinagar (Aurangabad) as an Assistant Professor. Over 15 International Publications to his credit. He guided more than 30 UG projects and 20 PG projects. His research interests include Power electronics, High Voltage Direct Current Transmissions (HVDC), and FACT.

Prof. Dr. A. S. Bhalchandra

She received her Ph.D. in Electronics Engineering from S.R.T.M. University, Nanded, India, in 2004. Currently, she is a professor of the Electronics Department, and Principal Government College of Engineering, Chh. Sambhajinagar (Aurangabad). She has guided 9 research students and 50+ m Tech students. She has received funding from DRDO and the Government of Maharashtra and contributed to 100 plus papers in reputed journals and conference proceedings. Her research interest includes image processing, signal processing and communication.

Measuring mechanical stresses using acoustoelasticity

A. A. Santos[3], **S. A. Garcia Ruano**[1], **V. V. Gonçalves**[2] and **D. M. G. Oliveira**[3]

[1]University of Richmond, USA
[2]Universidade Federal do Ceará, Brazil
[3]Universidade Estadual de Campinas, Brazil

Employing nondestructive techniques to evaluate the propensity to failures in mechanical components and structures has been the aim of many reliability teams throughout the time. Although many parameters can be used with such decision-making tools, stress is probably the most known parameter to classify the safety of mechanical systems. Notwithstanding, there are no universally recognized tool to measure internal stresses in solids. X-ray, neutron diffraction and other diffraction techniques are valuable, but are used only for a very superficial layer or require big equipment, not suitable to be employed in daily inspection activities in the field. This works presents the development of theoretical approaches and strategies to measure mechanical stresses using acoustoelasticity. The focus is on measuring them in conventional structural materials, as Aluminum and Steels, as well as in carbon fiber composites (CFRP). Besides, advanced structural joints, like the ones made by Friction Stir Welding are also evaluated. The results presented as a part of several works already published by the team show that the technique can give valuable information about the safety of the components, based on ultrasonic inspection, being an effective tool for field measurements.

Biography

Prof. Santos is full Professor at Universidade Estadual de Campinas (UNICAMP – Brazil, 2014). BS in Mech Eng (1987); MSc (1992); PhD (1996); Visiting Scholar in the Mech Eng Department at Texas A&M (1998-1999) and in the Department of Aerospace at University of Michigan (2014-2015). Coordinator of Railway Laboratory and of the Vehicle-Track Interaction Laboratory, as well as former coordinator of the Acoustoelasticity Laboratory, UNICAMP. Head of Mechanical Design Department (2011-2013). Coordinator of Control and Automation Engineering (2009-2011). Main research interests are: Acoustoelasticity, Vibration Energy Harvesting, Vehicle Dynamics, Multibody Vehicle Simulations, and Numerical Structural Analysis.

Elimination of secondary oxide phases in CdTe nanostructured thin films prepared by conventional spray pyrolysis, and the influence of thermal annealing

H. Robatjazi and **H. Eshghi**

Faculty of Physics, Shahrood University of Technology, Iran

In this presentation, thin films of cadmium telluride (CdTe) were prepared using conventional pyrolysis spray method on glass substrates at different temperatures (250°C, 300°C and 350°C). Field emission scanning electron microscope (FESEM) images showed that the substrate temperature significantly affects the morphology and thickness of the grown layers, and as the temperature increases, the morphology of the layers is very sensitive to the growth temperature. From the cross-sectional images, it is clear that as the temperature of the substrate increases, the thickness of the layers decreases (from 2.1 µm to 700 nm and 550 nm) and at a temperature of 350 the surface with columnar configurations made of relatively large nanosheets with a size of about 150 Covered up to 200 nm. Seebeck effect measurements showed that all studied layers have p-type conductivity. The results of X-ray diffraction and Raman spectroscopy showed that the layer grown at 350 °C has better crystalline quality of CdTe, although it still contains secondary oxide phase components (TeO_2, TeO_3 and $CdTeO_3$), consistent with the electrical resistivity analysis of the data. is the temperature. To remove the oxide phase components in this sample, we used the annealing process in the presence of N_2 gas flux for 1 hour at two different temperatures of 400°C and 450°C. According to the FESEM images, it is clear that increasing the annealing temperature increases their average size (200-250 nm) while the constituent grains are tightly packed. XRD diffraction, Raman spectra, and activation energy estimated from electrical resistivity analysis versus temperature data confirmed that annealing at 400 °C, the optimal annealing temperature, was sufficient to remove secondary oxide phase components.

Biography

Hossein Robatjazi was born in Shirvan, Iran in 1994. He is currently working in a factory as a lab supervisor. He received his MS (solid states of physics) from Shahrud University of Technology, Iran in 2019. His MS dissertation focused on synthesis and characteristics of nanostructured thin films. The method used to synthesis was spray pyrolysis approach. He also worked as a lab assistant and TA in same University. His recent publication was about elimination of secondary oxide phases in CdTe nanostructured thin films prepared spray pyrolysis and influence of thermal annealing. Currently his working on synthesis of antifouling boiler materials in alaforce plastofoam factory, Tehran, Iran. His research interests are in the area of synthesis of nanolayers and thin films, solar cells, nanostructured and nano particles.

Conjugated oligomers with Hetero-rings to improve photovoltaic performance

O. NINIS

Energy, Materials and Computing Physics Research Team,
Ecole Normale Supérieure, Abdelmalek Essaadi University, Morocco

Massive research efforts have been devoted to organic Solar Cells (OSCs). Although OSCs based on Bulk heterojunction have reached interesting solar-to-electrical power conversion efficiency values of 18%. Organic electronics based on π-conjugated molecules have become more interesting in much recent researches due to two major advantages over traditional semiconductors. On one hand, it allows the design and implementation of devices on flexible and transparent substrates, opening up new possibilities for a wide range of applications. On the other hand, it has lower costs compared to inorganic semiconductors, making it an attractive aspect for researchers.

Our work focuses on introducing a new heterocyclic copolymer. We examined in detail the corresponding oligomers. Various theoretical results were obtained using approaches based on Density-Functional Theory (DFT) and Time-Dependent DFT. DFT calculations are intriguingly involved in determining the characteristics of electronically excited states, particularly those directly linked to the optical spectra (absorption and emission) of molecules. The results cover the attainable properties using commonly accessible programs, delve into addressing environmental influences like solvents and surfaces, and highlight recent applications in these domains. The significance of theoretical calculations in molecular design, particularly in the field of conductive organic materials, arises from various experimental limitations, highlighting their value. In this regard, we analyze the geometry of a set of oligomers based of EDOT (3,4-ethylen dioxythiophen) and VC (vinyl-carbazol). The band gap with simulated spectra (UV–Vis spectra, emission spectra) and several photovoltaic properties like open-circuit photovoltage (Voc) and light harvesting efficiency (LHE) are predicted and discussed for giving theoretical knowledge of studied compound efficacity in photovoltaic application.

Biography

Her first professional calling was in science teaching, at the age of 24. She pursues a career in teaching as high school teacher of physics-chemistry. Venturing into academia, she gets her Master's degree and she wanted to prepare a doctoral thesis on new technology for solar energy in University of Fez. Her early research focused on theoretical studies of absorption, emission and photogeneration of organic molecules, then she became more interested by the polymer electronics and material modelling. After graduation, she joined ENS as assistant professor. She actually interested in making collaborations on her research topic in order to develop and explore new issues related to the application of polymers and oligomers in electronic, especially in photovoltaic devices.

Formation of a solid solution in a polycrystalline Sc_2O_3 upon irradiation with xenon ions with energies of 140 and 300 keV

A.E. Solovyeva

SFTI, Syxym, Abxazia

Cubic samples of Sc_2O_3 with a size (10^{-6} m^3) were prepared from powders of grade OS = 99.9 by pressing without a binder, at a pressure of 0.40–0.50 GPa and a temperature of 25°C. The samples were annealed at 1800°C in vacuum (5 hours of exposure) and then subjected to oxidation at 1400°C in air to constant weight. The X-ray density of the obtained samples was 3.9 kg/m^3. The structure and thickness of the studied layer were determined by the Sc_2O_3 X-ray method according to the dependence constructed from each reflection, taking into account absorption and scattering in depth. The X-ray penetration depth for Sc_2O_3 was 6 μm at angles 0 -70θ. The samples were irradiated in a holder with a fixed position at 25°C in a system with a cryogenic casing at liquid nitrogen temperature with an implantation dose of $5*10^{16}$ cm^{-2} at energies of 140 and 300 keV. The inelastic collision of heavy ions with the surface of the samples leads to an explosion. A shock wave is formed, which propagates in the form of transverse and longitudinal waves deep into the material, drawing xenon ions by inertia into the channels of the structure. Xenon ions are decelerated and lose some of their valence electrons upon collision, and a bond between xenon ions and oxygen anions and scandium cations occurs. An interstitial solid solution containing XeO_2 with an fcc structure in the Sc_2O_3 lattice is formed (Fig. 1). This structure is stable after irradiation. The anomalous increase in X-ray reflection in irradiated Sc_2O_3 samples was understood using the two sciences of solid state physics (change in lattice parameter, macro and micro stresses along the depth of Sc_2O_3) and quantum mechanics and determine the radiation energy, which is associated with the change in frequency and wavelength along the depth of the sample depending on the irradiation energy. Table 1 shows quantum changes in Sc_2O_3 at a depth of 4.6 μm depending on the irradiation energy.

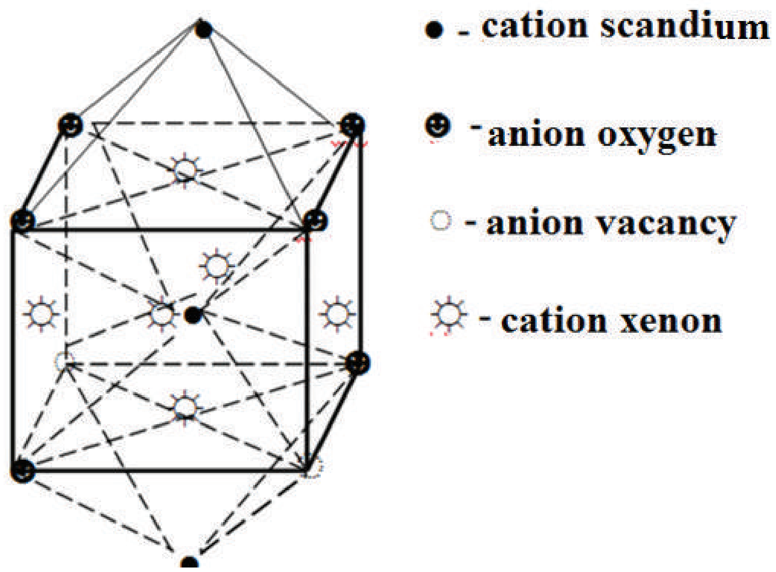

Fig. 1. Structural model of dissolution of xenon ions in the scandium oxide lattice when irradiated with xenon ions of different energies

Table 1 Results of analysis of reflections from the (440) plane in an scandium oxide lattice at a depth of 4,6 μm depending on the energy of irradiation with xenon ions

. Parameters	Standard	140 keV	300 keV
ν – Vibration frequency,▪ 10^{17}, Hz	19,48	23	27,5
N - Photon flux ▪ 10^{17}, imp./s	17,05	17,05	17,05
λ - wave length, ▪10^{-9} m	0,154	0,130	0,109
Flow energy, keV	8,05	9,5	11,3

Biography

In 1966 she graduated from the Polytechnic Institute with a degree in metal physics, and in 1995 she defended her doctoral dissertation in solid state physics. She work as a consultant on structural research of materials at the Physico-Technical Institute in Sukhum, Republic of Abkhazia.

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Application of reflecting coating on a building's roof thermal performance- A review

F Wurood Asaad M, S. Lina M. Shaker, Ruaa H. Abbas and **Ahmed Mahdi**

Department of Research Energy, Training and Research Office, Ministry of Electricity, Iraq

Effective building cooling techniques are crucial for energy efficiency, especially in hot climates. One such method involves the application of reflective coatings to building surfaces, which can significantly reduce heat absorption and lower cooling demands. These coatings, including paints, sealants, varnishes, and specialized options such as elastomeric and anti-graffiti coatings, not only enhance a building's longevity and appearance but also provide protection against environmental factors. Reflective coatings are designed to minimize heat absorption, enhance surface reflectivity, and reduce glare. They are widely used in applications such as mirrors, optical devices, solar panels, and reflective clothing. However, there remains a research gap in the development of cost-effective, scalable, and long-lasting radiative cooling materials that can be seamlessly integrated into architectural design. To fully realize the potential of these materials, further research is needed to evaluate their long-term durability, real-world performance, and their ability to maintain high cooling efficiency under various conditions. Addressing these challenges is critical for the widespread adoption of radiative cooling technologies in the construction industry and urban planning to combat climate change and reduce energy consumption.

Biography

Dr. Wurood Asaad Midab Training and Research Office, Research Energy Department, Ministry of Electricity, Baghdad, Iraq, Finished her study in the Department of Metallurgical Engineering/ College of Materials Engineering/ University of Babylon. She obtained the Degree of Doctor of Philosophy in Materials Engineering / Metallurgical

PEERS ALLEY MEDIA

Smart nanocomposites of conjugated polymers for sensing applications

A. Pud[1], N. Ogurtsov[1], Yu. Noskov[1], N. Davydenko[1], I. Myronyuk[1], O. Kukla[2], A. Mamykin[2], N. Redon[3] and **Jean-Luc Wojkiewicz[3]**

[1]V. P. Kukhar Institute of Bioorganic Chemistry and Petrochemistry, NAS of Ukraine, Ukraine
[2]V. E. Lashkaryov Institute of Semiconductor Physics, NAS of Ukraine, Ukraine
[3]Center for Energy and Environment, IMT Nord Europe, Institut Mines-Télécom, University of Lille, France

Interest in smart materials stems from their multifunctionality and ability to reversibly respond to external stimuli by changing their characteristics (electrical conductivity, color, optical, volume, temperature, hydrophilicity/hydrophobicity, shape, etc.). In particular, smart hybrid nanocomposites which combine the properties of multifunctional conductive and/or non-conductive conjugated polymers or biopolymers and inorganic or organic (nano)materials sensitive to various physical influences, allow to register or at list to sense changes in the surrounding atmosphere or exhaled breath of patients, to deliver drugs or diagnostic agents in living organisms, to adsorb heavy metal ions and toxic organic compounds from various natural waters, to shield/absorb electromagnetic radiation, etc. However, efficiency of participation of such smart nanocomposites in these applications depends on intermolecular interactions between their components, which strongly affect properties of the material as a whole. That is why we direct our research to better understand how these interactions affect structure, morphology and properties of nanocomposites of conjugated polymers (polyaniline, polypyrrole, poly(3-methylthiophene), poly(3,4-ethylenedioxythiophene, etc.) compared to the pure components. In this report we consider how and why such materials can reversibly react to the composition of the external environment, in particular to vapors of various compounds, and how such reactions can be controlled. In particular, the influence of specific interactions at the interface between nanocomposite components and polymerization conditions on structure, morphology, electrical characteristics and their role in sensing behavior and applications of the conductive nanocomposites to detect toxic volatile substances (ammonia, amines, organic solvents, chemical warfare agent simulants) will be considered. Some attention will be paid to using the developed materials for the removal of harmful compounds from water environments, and for interaction with external physical stimuli (electromagnetic interference shielding, etc.).

Biography

Professor Alexander Pud since 2009 is the Head of the Department of Chemistry of Functional Materials of the V.P. Kukhar Institute of Bioorganic Chemistry and Petrochemistry of NAS of Ukraine. He graduated from Kiev Polytechnic Institute, Department of Electrochemical Productions Technology (1979). In 1985 and 2004 he received PhD degree and Dr. Sci. (HDR) in Polymer Science, at Chemistry Department of Taras Shevchenko National University of Kyiv. In 2011 he became the Professor in Physical Chemistry. His research interests currently are in fields of formation, properties and functioning of intrinsically conducting/conjugated polymers (ICP), and nanocomposites in dispersion and solid-phase media; synthesis, properties and applications of multifunctional host-guest (core-shell) hybrid nanocomposites of ICP (e.g. polyaniline, polythiophene, polypyrrole and their derivatives) with both polymers of other nature and inorganic nanoparticles (semiconductor, dielectric, magnetic etc.).

Microstructure, mechanical and corrosion properties of anodized ultrafine-grained titanium based materials for medical application

D.R. Mihajlović[1], **M.P. Rakin**[1], **B. I. Međo**[1] and **V.R. Đokić**[2]

[1]Faculty of Technology and Metallurgy, University of Belgrade, Serbia
[2]Innovation Centre of the Faculty of Technology and Metallurgy, Serbia

The Ti-13Nb-13Zr (TNZ) alloy and commercially pure titanium (cpTi), before and after the high pressure torsion (HPT) process preformed under pressure of 4.1 GPa with a rotational speed of 0.2 rpm up to 5 rotations at room temperature, was examined. All titanium based materials were subjected to electrochemical anodization. The electrochemical anodization was done in 1M H_3PO_4 + 0.5 wt. % NaF electrolyte during 60 and 90 minutes, for the desired potential of 25V with a scan rate of 100 mVs^{-1}. As the result of the surface modification nanostructured titanium based oxide layer was obtained. The anodized materials surface was analysed using the scanning electron microscopy (SEM), the atomic force microscopy (AFM) and the X-ray diffraction (XRD). The electrochemical impedance spectroscopy (EIS) technique was used to determine the corrosion resistance of the titanium based materials before and after HPT and electrochemical anodization. These materials were exposed to a solution simulating conditions in the human body (Ringer's solution and artificial saliva) with pH of 5.5 at a temperature of 37 °C. The mechanical behaviour of anodized materials surface was examined by nanoindentation test. The control of nanoindentation test was done by total displacement. The test was performed on a nanoindenter *G200, Agilent Technologies*, using as an indenter the Berkovich-type diamond tip. As results, the mean value of ten measurements of the surface modulus of elasticity and nanohardness were obtained. Results show that electrochemical anodization led to the formation of the nanotube oxide layer on the surface of titanium-based materials. All examined titanium based materials showed adequate corrosion protection for application as implant in human body. While, electrochemical anodization led to a decrease or an increase of the corrosion protection, depending on the nanotube oxide layer morphology.

Biography

Dragana R. Mihajlović (born as Barjaktarević), PhD in Technical and Technological sciences - Materials Engineering, is a Research Associate in University of Belgrade, Faculty of Technology and Metallurgy. Dragana R. Mihajlović focused her scientific research on several areas: the application of the high - pressure torsion process in order to obtain the ultrafine-grained microstructure of metallic biomaterials, the application and optimization of the electrochemical anodization process to obtain the nanostructured surface on metallic biomaterials, the examination of mechanical properties, corrosion damage and biocompatibility of the metallic materials used for the replacement of bone tissues in the human organism, as well as the creation and analysis of numerical models using the finite element method in the licensed software package *Abaqus*.

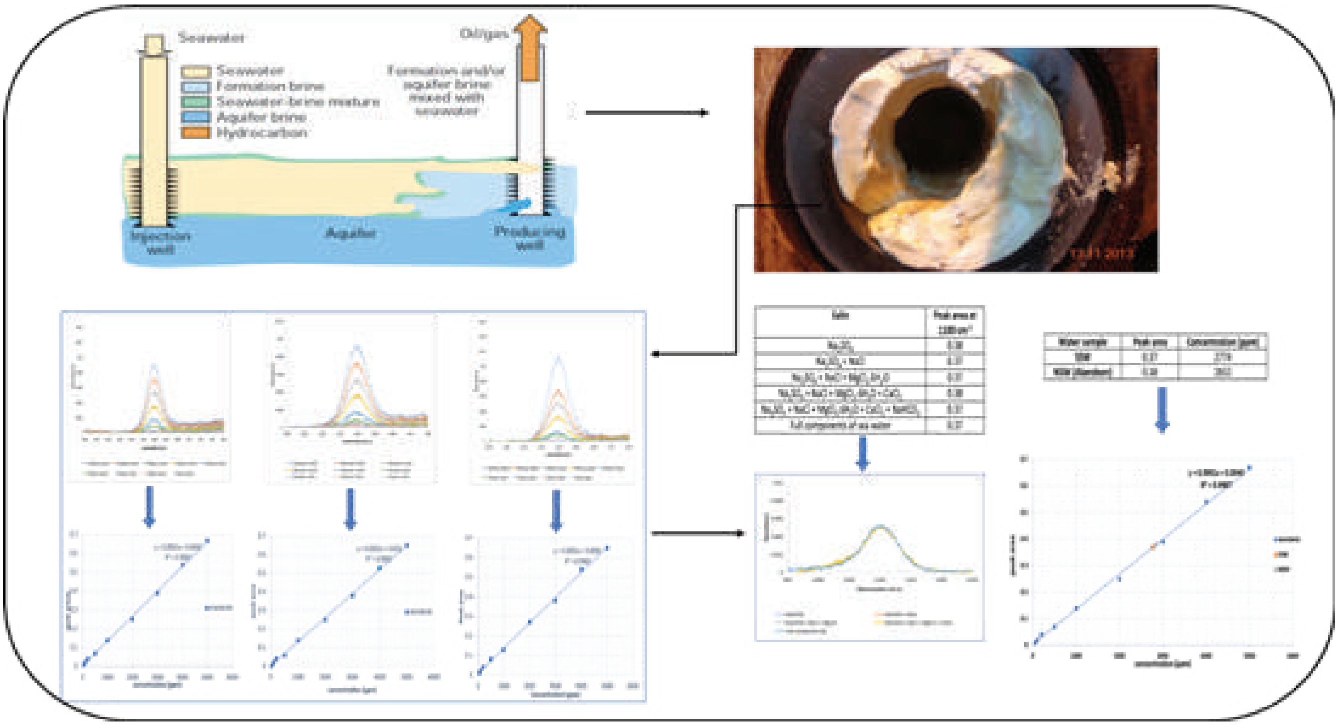
Novel approach to assess seawater breakthrough using FTIR spectroscopy

Hauwa A. Rasheed

Nile University of Nigeria, Nigeria

Seawater is the most often used source of water for injection into reservoirs during secondary recovery operations in oilfields to maximize production. However, when such a procedure is employed, serious damage such as scale formation, may result due to the compositional differences between seawater and formation water. Scale is an assemblage of mineral deposits, and can form in all stages of production as long as water is present. Scale formation is a serious issue for the oil and gas industry. It is one of the major reasons for the decline in oil production worldwide. For that reason, a rapid and easy technique was developed making use of attenuated total reflectance Fourier-transform infrared spectroscopy (ATR-FTIR) to monitor the composition of the produced brine for any indication of seawater breakthrough as well as estimating the seawater fraction. The concentration of sulphate ions (SO_4^{2-}) present in the produced water, which is primarily responsible for scale formation was determined using this technique. The estimated limit of detection (LOD) and limit of quantification (LOQ) for SO_4^{2-} were found to be 50 ppm and 100 ppm, respectively. The presence of other ions in the water does not affect the instrument's sensitivity in terms of detecting and determining the concentration of SO_4^{2-}. Plotting the linearity between the actual and measured concentrations revealed a strong correlation between the two values, indicating that FTIR can be a potentially quick, simple, dependable, and inexpensive method to assess seawater breakthrough.

Graphical Abstract



Biography

Hauwa completed her undergraduate degree in chemistry at Bayero University Kano and a MSc in Oil and Gas Chemistry from University of Aberdeen, UK. Hauwa is now a PhD student at Department of Industrial Chemistry, Nile University of Nigeria. She is currently working on the Synthesis and Optimization of Carboxymethyl Cellulose from Agricultural wastes for use in Oil and Gas field operations.

Green particle board production from Agro-forest residue valorization

Prosper Mensah[1], Maila Janaína Coêlho de Souza[2], Rafael Rodolfo de Melo[3], José Benedito Guimarães Junior[4], Adriano Reis Prazeres Mascarenhas[4], Edgley Alves de Oliveira Paula[3], Talita Dantas Pedrosa[3], Daniel Maskell[5] and **Francisco Rodolfo Junior[6]**

[1]CSIR-Forestry Research Institute of Ghana,
Wood Industry and Utilisation Division, Kumasi-Ghana
[2]Agricultural Sciences Academic Unit, Federal University of Rio Grande do Norte-UFRN, Brazil
[3]Agricultural Science Center, Federal University of the Semiarid-UFERSA, Brazil
[4]Department of Engineering, Federal University of Lavras-UFLA, Brazil
[5]Department of Architecture and Civil Engineering, University of Bath, UK
[6]Department of Engineering, Federal University of Piauí - UFPI, Brazil

Reusing agro-industrial residues does not only help to mitigate environmental impact but also enables valorization through the development of new products. The aim is to enhance the physical and mechanical properties of particleboard panels produced with *Eucalyptus* wood and different proportions of residue products-coconut fibre (*Cocos nucifera L.*). Physical properties (density and dimensional stability) and mechanical properties (static bending and internal bond resistance) were assessed, and panels reinforced with coconut fibre showed the best qualities with higher density, greater dimensional stability, and less water absorption. Static bending resistance and internal bond resistance also increased significantly. The results indicate that the density of the particleboards produced ranged from 630 kg/m^3 to 810 kg/m^3. The water absorption property of the particleboards also ranged from 36.79% to 65.52% and 50.06% to 115.80% for 2-hour and 24-hour immersions respectively. Additionally, the thickness swelling of the particleboards ranged from 5.11% to 30.10% and 8.06% to 38.70% for 2-hour, and 24-hour immersions respectively. The results further indicate that the modulus of elasticity, modulus of rupture and internal bond strength of the particleboards produced were adequate and acceptable. The micrographs indicate that the cohesion in the matrix is a recipe for better physical and mechanical properties performance of the produced

panels. This demonstrated the potential of achieving compatible characteristics for civil construction and furniture production through the inclusion of residue materials. The impact of this research is obtained from the utilization of an important agro-industrial residue in the manufacture of permanent composites.

Biography

Prosper Mensah is a collaborative and a meticulous research scientist. His area of interest includes but not limited to characterisation of timber, wood-based and non-wood-based composite products for efficient utilisation, conduct research into non-timber forest products, industrial utilization of available biomass for the production of fibreboards to build cost effective and affordable furniture and housing in Ghana, characterisation of smaller diameter logs, durability studies in wood and fibreboards. Has knowledge in timber and non-Timber products, sustainability supply chain management, wood machines with hands-on experience in sawmilling of wood, furniture manufacture and testing. Contribute to an effective teaching, training and he is a handyman. He is an excellent problem-solver, detailed oriented and possesses good oral and written communication skills. He has contributed in extending knowledge as could be verified in his associations. He obtained his Ph.D. in Wood Science and Technology from the University of Education, Winneba, Ghana in 2021.

Quantum correlations in two interacting spins under thermal effect

M. Yachi

Laboratory of Innovation in Sciences, Technologies and Modelisation,
Faculty of Sciences, Chouaib Doukkali University, Morocco

We study the thermal quantum correlations and quantum coherence in an anisotropic two- qubit Heisenberg XY system with Dzyaloshinskii-Moriya interaction in thermal equilibrium at temperature T and in the presence of a uniform magnetic field B. Our results show that magnetic anisotropy increases the entanglement and the quantum correlations appear in all temperature intervals. By increasing the magnetic anisotropy, it is found that the quantum coherence appears from a minimum temperature. Additionally, by increasing the magnetic anisotropy, we show the violation of Bell-CHSH inequality, and consequently the enhancement of quantum entanglement.

Biography

Mouhcine Yachi, currently a third-year PhD student at the Faculty of Sciences, Chouaib Doukkali University. At 30 years old, he has authored a paper in the Journal of Physics A: Mathematical and Theoretical.

Comparative study on industrial processabilities of cellulosic raw materials for eco-friendly textile production

Kaniz Moriam[1,2], **Heikki Hassi**[3], **Eric Enqvist**[3],
Huy Quang Lê[2,3] and **Michael Hummel**[2]

[1]Massachusetts Institute of Technology, USA
[2]Aalto University, Finland
[3]SciTech Service Limited, Finland

Lyocell, considered as sustainable industrial technology for regenerated cellulosic fibers production, has been expanding in capacity in recent years. Even though currently mostly using a particularly designated pulp class (lyocell-grade dissolving pulp) as raw materials, the lyocell process can potentially convert a wide range of cellulose-based raw materials into fibers due to the efficient dissolution capacity of N-methylmorpholine N-oxide (NMMO) monohydrate. This work assesses the suitability of different cellulose-based raw materials for the NMMO-lyocell technology with an emphasis on industrial processabilities. The selected raw materials were tested for dissolution extent in NMMO, after which the cellulose solutions (dopes) were comprehensively analysed with emphasis on rheological properties as bases for evaluating the possible behaviours in the lyocell process.

Biography

Kaniz Moriam is a postdoctoral research fellow at the Massachusetts Institute of Technology, USA. She earned her Ph.D. in chemical engineering from Aalto University, Finland, in 2022. After completing her PhD, she worked as a senior scientist for a year at a Finnish company called SciTech Service Limited. Currently, her research at MIT focuses on devising strategies to enhance the efficiency of textile recycling through an in-depth exploration of the rheological properties of cellulose solutions and the optimization of fiber spinning techniques. Additionally, she is working to promote and augment the production of environmentally friendly and biodegradable cellulose-based textiles.

Two-stage cultivation as effective strategy for enhanced productivity in plant and microalgal cell culture systems

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[3]Department of Botany and Microbiology, Faculty of Science, Cairo University, Egypt

Depleting fossil fuels, destruction of flora and fauna and climate change have made plant and microalgal cell culture systems being seen as viable alternatives for the production of bio- and green fuels, biochemicals, biomaterials and biopharmaceuticals. The challenges that have hampered rapid progress have been attributed to the slow cell growth, low productivity, and poor metabolite secretion. Especially for plant cells, there are issues related to cell aggregation, shear sensitivity, and excessive foaming. Optimization strategies include improvement of medium components and cultural conditions. More rational approaches may involve strain improvement and directed evolution, understanding the biochemical and signal transduction pathways and making use of the advanced omics technologies for metabolic and genetic engineering of products of interest. Two-stage cultivation strategy can be adopted as a more rapid approach to overcome the drawbacks of single-stage cultivation by promoting biomass production and compound accumulation through controlled or stress conditions, thus elevating the productivity and identifying the induced compounds that can be targeted for further optimization work. In the case of *Morinda elliptica* cell cultures, the formulated Intermediary and Production medium strategies have enhanced productivity and Anthraquinones production by several fold compared to under Maintenance medium or elicitation with biotic or abiotic elicitors. With *Centella asiatica* cell cultures however, only stress-related compounds are induced, but not the targeted Asiatic and Madecassic acid, and Asiaticoside and Madecassoside. In the two-stage cultivation of *Chlorella vulgaris*, the combined stress factors involving light intensity, salinity, and nitrogen limitation have led to simultaneous production of biomass and high-value products with enhanced antioxidant activities. The different levels of antioxidant activities suggest the variety of induced phytochemical compounds under defined stressed conditions.

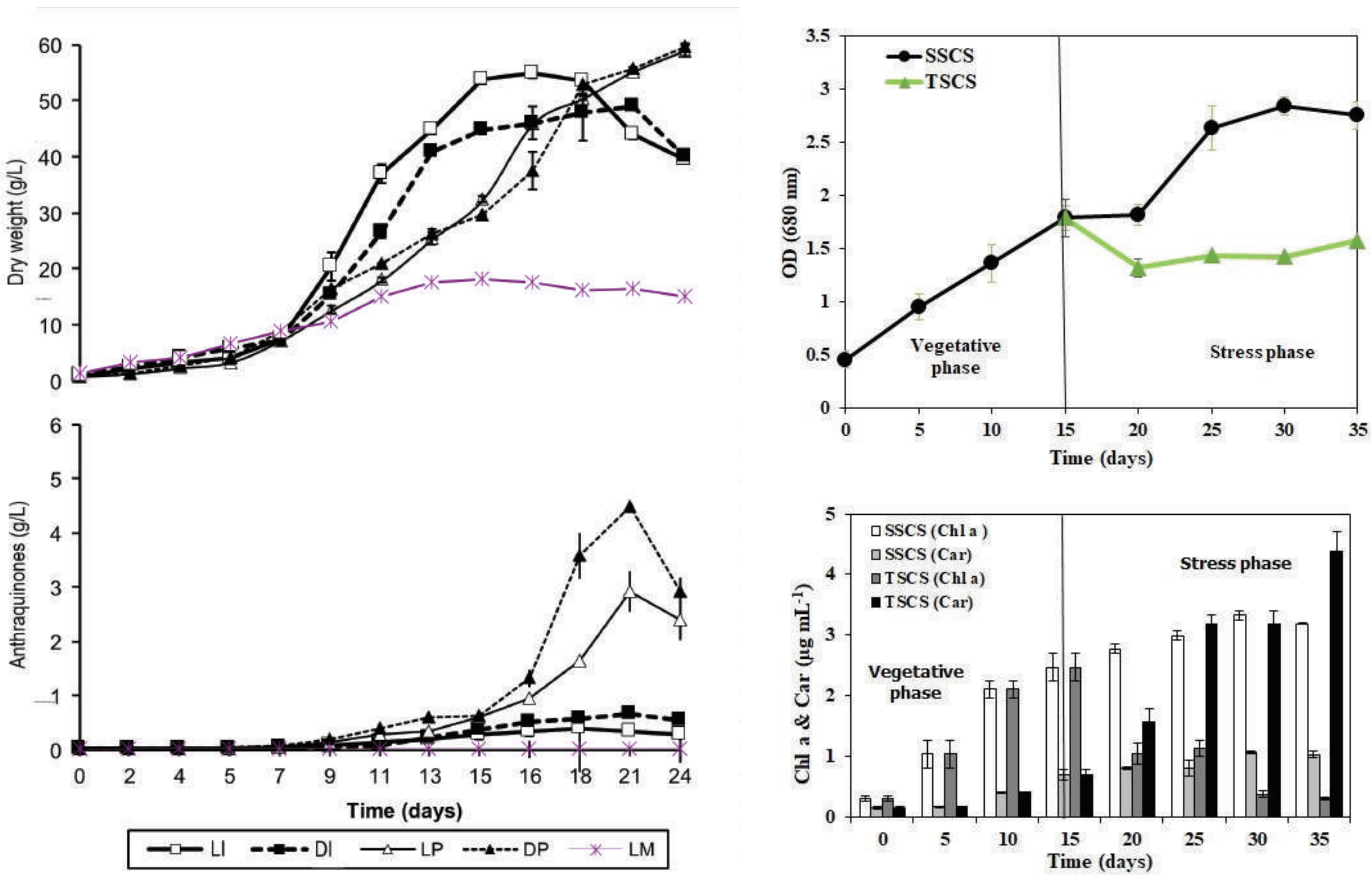

Figure 1: a) Cell growth and Anthraquinones production of *Morinda elliptica* under Light (L) and Dark (D) exposure in Maintenance (M), Intermediary (I) and Production (P) medium strategies; b) Two-stage cultivation system (TSCS) of *Chlorella vulgaris* under vegetative and stress phases against Single stage cultivation system (SSCS) for the productions of Chlorophyll a (Chl a) and Carotenoids (Car)

Biography

Mohd Azmuddin Abdullah obtained an M. Eng in Chemical Engineering and Biotechnology (1994) from the University of Manchester Institute of Science and Technology, United Kingdom, and a PhD in Bioprocess Engineering (1999) from Universiti Putra Malaysia (UPM). He was a Visiting Scientist (1997) in Kinki University, Japan, and a Post-Doctoral Fellow (2000-2001) at the Biomaterials Science and Engineering Laboratory, Massachusetts Institute of Technology, USA. He was an Academic in UPM (1994-2004), Universiti Teknologi PETRONAS (2004-2014), and Universiti Malaysia Terengganu (2015-2021). He is the Director of R&D in SIBCo Medical and Pharmaceuticals Sdn. Bhd. since August 2021. He has authored 200 articles, presented in 45 conferences and filed 6 patents, and 3 trademarks, on bioenergy, bioproducts and biopharmaceuticals. In 2015, he was awarded the Teaching Excellence Award by the Association for the Advancement of Biodiversity Science, India, and in 2017, the Scientist Medal by the International Association of Advanced Materials, Sweden.

Hypoxic bone mesenchymal stem cell-derived exosomes direct Schwann cells proliferation, migration, and paracrine to accelerate nerve regeneration *via* circRNA_Nkd2/miR-214-3p/MED19 axis

Haopeng Wang and **Shiting Li**

Shanghai Jiaotong University School of Medicine Xinhua Hospital, China

Background: Facial nerves have the potential for regeneration following injury, but this process is often challenging and slow. Schwann cells (SCs) are pivotal in this process. Bone mesenchymal stem cells (BMSC)-derived exosomes promote tissue repair through paracrine action, with hypoxic preconditioning enhancing their effects.

Objective: The main purpose of this study was to determine whether hypoxia-preconditioned BMSC-derived exosomes (Hypo-Exos) exhibit a greater therapeutic effect on facial nerve repair/regeneration and reveal the mechanism.

Methods: CCK-8, Edu, Transwell, and ELISA assays were used to evaluate the functions of Hypo-Exos in SCs. Histological analysis and Vibrissae Movements (VMs) recovery were used to evaluate the therapeutic effects of Hypo-Exos in rat model. circRNA array was used to identify the significantly differentially expressed exosomal circRNAs between normoxia-preconditioned BMSC-derived exosomes (Nor-Exos) and Hypo-Exos. miRDB, TargetScan, double luciferase assay, qRT-PCR and WB were used to predict and identify potential exosomal cirRNA_Nkd2-complementary miRNAs and its target gene. The function of exosomal circRNA_Nkd2 in facial nerve repair/regeneration was evaluated by cell and animal experiments.

Results: This study confirmed that Hypo-Exos more effectively promote SCs proliferation, migration, and paracrine function, accelerating facial nerve repair following facial nerve injury (FNI) compared with Nor-Exos. Furthermore, circRNA analysis identified significant enrichment of circRNA_Nkd2 in Hypo-Exos compared with Nor-Exos. Exosomal circRNA_Nkd2 positively regulates mediator complex subunit 19 (MED19) expression by sponging rno-miR-214-3p.

Conclusion: Our results demonstrate a mechanism by which Hypo-Exos enhance SCs proliferation, migration, and paracrine function and facial nerve repair and regeneration following FNI through the circRNA_Nkd2/miR-214-3p/Med19 axis. Hypoxic preconditioning is an effective and promising method for optimizing the therapeutic action of BMSC-derived exosomes in FNI.

Biography

Haopeng Wang, is a PhD student at Shanghai Jiao Tong University, studying at the Cranial Nerve Disease Center of Shanghai Jiao Tong University under the supervision of Prof. Shiting Li, 1st rotating president of the World Neurosurgeon Federation of Cranial Nerve Disorders. Haopeng Wang specialized in both clinical and basic research in the field of facial nerve injury and repair, and is passionate about improving facial paralysis. He engaged in FNI regeneration research for many years, and has been conducting research on exosomes to accelerate FNI regeneration for more than 2 years in Cranial Nerve Disease Center of Shanghai Jiao Tong University. This is the first time that his findings be reported in international conference.

Video steganalysis system for the cross domain steganography

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The Cross-domain Steganalysis research focusses on multiple domain video steganography, single steganalysis technique to detect the secret messages and deep learning for classification and computational efficiency for Steganalysis. The video steganography has been performed using the techniques, namely, Partition Modes (PMs), Motion Vector (MVs), Intra Prediction Modes (IPMs), Quantization Parameters (QPs), and DCT coefficients. These different domain steganography methods had associated steganalysis techniques.

Most of these methods are at a preliminary stage, more generalized solutions for secure video processing is expected. The use of steganography domains for secrete message embedding belongs to individuals, but generalized video steganalysis regardless of the video steganography method is a key requirement of real-time applications.

There are four main objectives of this research viz, to design novel video steganalysis techniques for cross-domain video steganography methods, to design and implement video steganography techniques across the different domains, to propose cross-domain steganalysis by estimating the global features set for multi-domain video steganography methods, to design the cross-domain steganalysis using deep learning classifiers for performance improvement and to design, model, and evaluate the performance of proposed steganalysis methods with state-of-art techniques using different datasets.

Proposed model for video steganalysis system:

Following are the steps of proposed model:

1. Brose the input pair of cover and stego video sequences from the dataset
2. Perform the steganography using either PM-domain or MV-domain, or IPM-domain techniques.
3. Fed the outcome of steganography techniques as compressed video to cross-domain features extraction.

4. Perform the filtering on each frame.
5. Extract the domain-independent features called Global Features Set (GFS) from the compressed video sequence.
6. Extract the domain-dependent features called Domain Specific Features (DSF) from the compressed video sequence.
7. Build the joint cross-domain feature vector for steganalysis.

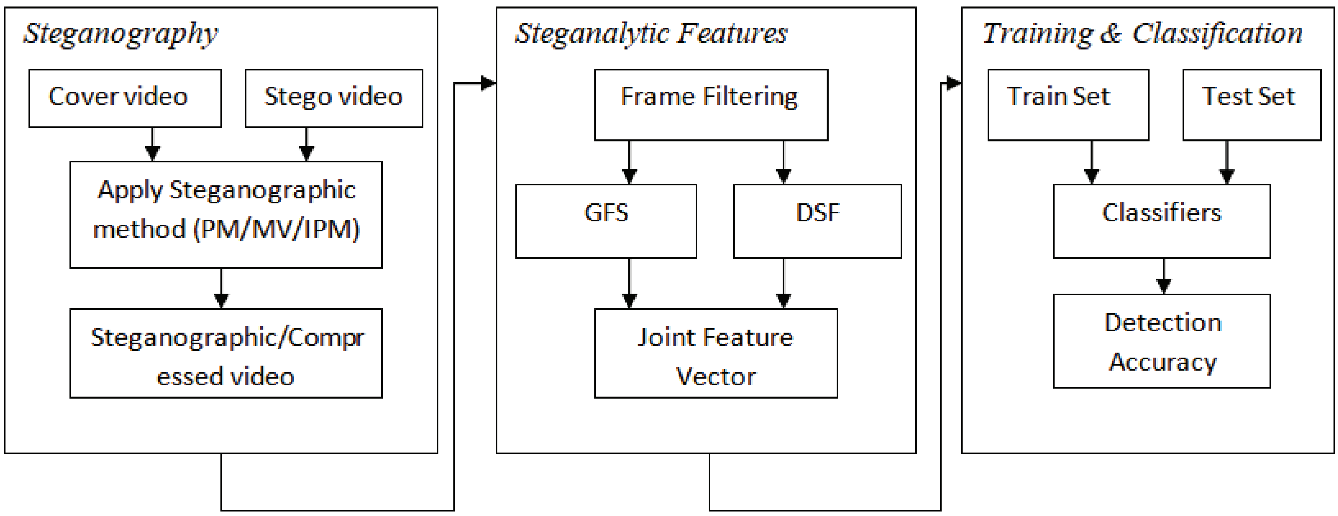

Figure 1. Proposed video steganalysis system

Dataset: For the performance analysis, we used uncompressed video sequences. Every video sequence is progressively scanned and stored as a raw video file in the 4:2:0 Chroma sampling format (YUV420p). This dataset consists of 100 uncompressed video sequences at CIF resolution with an average of 220 frames per sequence.

Performance Metrics: The commonly used performance metric to evaluate the performance of Steganalysis methods is Detection Accuracy. It is computed as:

$$Accuracy = 1 - \frac{1}{2}\left(P^{FA} + P^{MD}\right) \quad (1)$$

Where P^{FA} is probability of is false alarm and P^{MD} is probability of missed detection.

Steganographic Methods: To evaluate the proposed detection method performance of the proposed features, three types of video steganography, i.e., PM-based steganography, MV-based steganography, and IPM-based are used steganography as targets for experiments. For PM-domain, we implemented method given in [2] called as Tar1, for MV-domain, we implemented method given in [3] called as Tar2 and for IPM-domain, we implemented method given in [4] called as Tar3.

Steganalytic Methods: To compare proposed feature set with the previous methods in three embedding domains, two types of steganalytic methods are also selected to build detectors for comparative analysis. We compare the performance of proposed CDVS technique with MVC [5] and H.Zhang [6]. Both these steganalytic techniques are independent on steganography domains.

Simulation Results:

Table 1. Performance of detection accuracy using Tar 1

Embedding Rate	H.Zhang	MVC	CDVS
0.05	0.924	0.928	0.9351
0.1	0.941	0.949	0.956
0.2	0.956	0.961	0.969
0.3	0.973	0.981	0.989
0.4	0.979	0.984	0.991
0.5	0.9841	0.985	0.994

Table 2. Performance of detection accuracy using Tar 2

Embedding Rate	H.Zhang	MVC	CDVS
0.05	0.914	0.918	0.928
0.1	0.931	0.937	0.947
0.2	0.945	0.949	0.959
0.3	0.965	0.971	0.979
0.4	0.968	0.972	0.983
0.5	0.978	0.981	0.989

Table 3. Performance of detection accuracy using Tar 3

Embedding Rate	H.Zhang	MVC	CDVS
0.05	0.923	0.927	0.931
0.1	0.938	0.942	0.947
0.2	0.951	0.957	0.961
0.3	0.959	0.964	0.968
0.4	0.967	0.971	0.981
0.5	0.971	0.975	0.986

Table 4. Comparative of features extraction time

Methods	Accuracy (%)	Classification Time (Seconds)
H.Zhang	0.9537	4.12
MVC	0.9584	3.71
CDVS	0.9662	3.42

Synthesis of novel vicinal diaryl triazoles with sulfur and hydrazine linkers as highly potent anticancer and antioxidant agents

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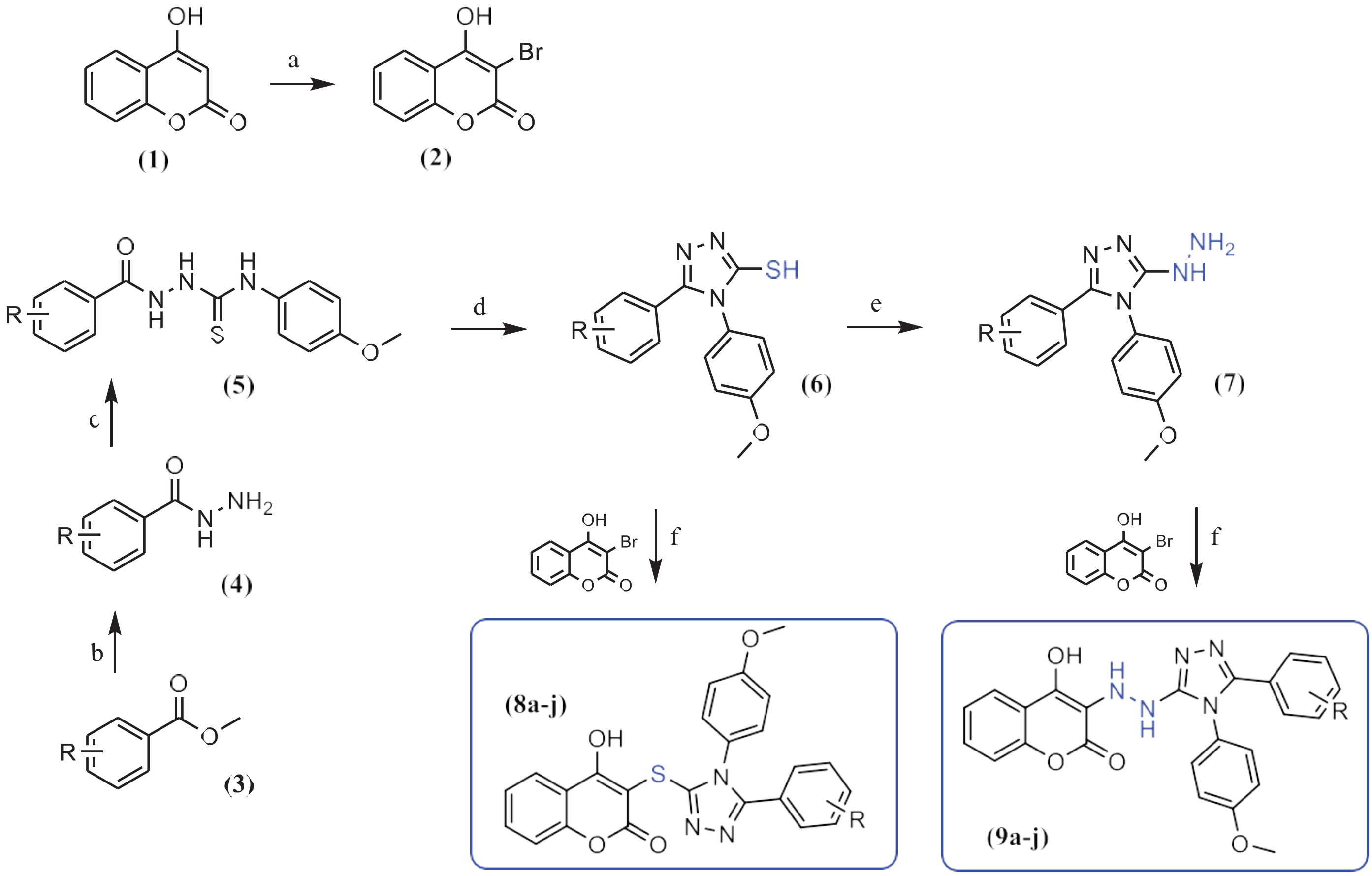
[2]Molecular and Cell Biology Research Center, Department of Immunology, Faculty of Medicine, Mazandaran University of Medical Sciences, Iran
[3]Department of Environmental Health Engineering, Faculty of Paramedical Sciences, Babol University of Medicinal Sciences, Iran

Objective: Heading the list of the critical health-related issues worldwide, cancer continues to be a one of the most serious life-threatening diseases. Moreover, development of new antioxidants is a field of growing interest because some synthetic antioxidants such as BHA and BHT are now suspected to be potentially harmful to human health.

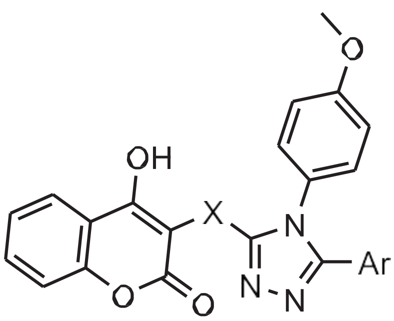
Methods: Accordingly, two series of 1,2,4-triazole–ring-containing combretastatin analogs; **8a-j** with sulfur linker and **9a-j** with hydrazine linker were synthesized (Scheme 1). All twenty compounds were tested *in vitro* for their anticancer activity on three different cancer cell lines including A549, MCF7, and HepG2. In addition, the antioxidant activity of all derivatives was evaluated using FRAP assay and DPPH test (Table 1).

Results: A superior cytotoxic activity of all compounds with sulfur linker **(8)** as compared to doxorubicin, on A549, MCF7 cancer cells, was observed. Furthermore, the best results against HepG2, were obtained for **8e, 8c, 8f** and **8g.** The compounds 8e, bearing 3,4,5- methoxy phenyl moiety, was the most potent radical scavenger in the DPPH method and were also had the superior capacity in the FRAP assay.

Conclusion: The SAR analysis indicated that the sulfanyl triazole fragment is better than hydrazineyl triazole for anticancer activity. The *in vitro* cytotoxic activity of vicinal diaryl triazoles bearing sulfur linker, **8**, make them as good leads for the development of new anticancer agents. The obtained data from cytotoxic and antioxidant assays indicated that the introduction of a sulfur linker along with a 3,4,5-tri-methoxyphenyl moiety in 8e results in excellent anticancer potency and antioxidant ability to the prototype triazolyl coumarin compounds.



Scheme 1. Synthesis of 1,2-diaryl-1,2,4-triazoles 8a-j and 9a-j. Reagents and conditions: (a) Br_2, $CHCl_3$, rt, 12h; (b) hydrazine hydrate, EtOH, reflux, 3h; (c) 4-methoxyphenyl isothiocyanate, EtOH, reflux, 5h; (d) NaOH 1M, reflux, 3h; (e) hydrazine hydrate, EtOH, reflux, 3h; (f) $NaHCO_3$, EtOH, rt, 24h.



Compound	X	Ar	Anticancer activity (µg/ml)			Antioxidant activity	
			A549	MCF-7	HepG2	FRAP value (mmol Fe^{2+}/l)	DPPH (% inhibition)
8a	S	Ph	5.58	4.38	14.32	183	46
8b	S	4-Me-Ph	4.15	4.58	18.56	207	50
8c	S	4-OH-Ph	3.91	4.90	8.30	250	69.82
8d	S	4-OMe-Ph	4.78	5.52	24.02	266	81
8e	S	3,4,5-$(OMe)_3$-Ph	6.43	5.21	4.29	442.5	88.37
8f	S	3-Br-Ph	7.05	8.13	9.90	229	80
8g	S	4-F-Ph	4.28	4.24	8.03	138	30.2
8h	S	4-NO_2-Ph	4.64	4.80	33.19	215	55
8i	S	2,4-Cl_2-Ph	4.04	6.25	17.16	225	60
8j	S	4-Pyridyl	5.20	4.27	15.86	163	40
9a	NHNH	Ph	36.87	40.98	41.83	426	62.5
9b	NHNH	4-Me-Ph	17.30	35.70	44.81	382.5	55
9c	NHNH	4-OH-Ph	16.21	23.08	47.27	216	50.9
9d	NHNH	4-OMe-Ph	25.68	20.02	55.90	172.5	30.2
9e	NHNH	3,4,5-$(OMe)_3$-Ph	28.82	15.16	19.70	397.5	66.6
9f	NHNH	3-Br-Ph	23.25	14.15	18.92	190	59.5
9g	NHNH	4-F-Ph	17.66	27.90	32.42	451	85.5
9h	NHNH	4-Cl-Ph	22.79	24.27	26.59	133.2	26.36
9i	NHNH	2,4-Cl_2-Ph	16.63	27.00	22.23	182.5	40.2
9j	NHNH	4-Pyridyl	22.75	18.20	22.61	184	40.8
Doxorubicine			11.34	12.89	12.48		
BHT						-	95

Table 1. Cytotoxic activities (IC_{50}, µg/ml), DPPH (inhibition%) and FRAP Values (mmol Fe2+/l)) of compounds **8a-j** and **9a-j.**

Biography

Dr. Seyedeh Mahdieh Hashemi is currently an assistant professor at Mazandaran University of Medical Sciences in Iran. She received his Ph.D. in medicinal chemistry from the Faculty of Pharmacy at the Mazandaran University of Medical Sciences, in 2015.

Dr. Hashemi has shown a successful mentorship and collaborative record during her career. She has supervised 25 graduate students. Dr. Hashemi serves as an editorial board member or editorial advisory board of several journals.

The emphasis of Dr. Hashemi's research lies on the interface between chemistry and biology, with specific proposals being focused on the fields of medicinal chemistry, and organic chemistry. Her research can be described as "applying synthetic organic chemistry to problems in biology". Specific areas currently under investigation include designing and developing anticancer, anti-diabetes, anti-convulsant, neuroprotective and antifungal agents. Dr. Hashemi's contributions have resulted in 24 peer-reviewed publications, 3 issued patents, and 9 meeting abstracts.

Collocation method for fuzzy fractional integro-differential equations

Suvankar Biswas

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Fractional-order calculus offers more significant potential for managing complex systems than traditional integer-order calculus because it is more capable to describe the nonlinear and nonlocal characteristics of time series. And fuzzy Mathematics is one of the best ways to handle uncertainty, particularly when the uncertainty is based on a non-random process. The uncertainty may arise due to a lack of information about a problem or the data from a source that is not fully trustworthy or multiple pieces of information that are conflicting with each other. Therefore, combining these two concepts gives a huge advantage over classical equations. In more recent times, FFDEs have been presented as a means of addressing the uncertainty that arises in several mathematical simulations of various real-life situations. Many researchers are devoted their interest to working on FFDEs and their applications. Therefore, it has been decided to examine a linear fractional order fuzzy integro-differential equation. Consideration has been given to the most popular and sophisticated Caputo fractional order derivative. A collocation method based on the Lagrange interpolation basis polynomial has been created by modifying the usual collocation method for this equation. The collocation points are chosen based on Chebyshev extreme points or Gauss-Lobatto-Chebyshev points of order N. The fractional Gauss-Jacobi quadrature method has been used to approximate the fractional integral terms of the proposed equation. The existence and uniqueness conditions are analyzed for the solution of the equation. The Convergence analysis of the proposed numerical technique is done. Some numerical experiments have been performed to verify the proposed method. Five different kinds of errors have been computed and compared to do the error analysis. The numerical results of the proposed technique have been compared with an existing method.

Biography

Suvankar Biswas graduated from A. P. C. College under West Bengal State University in 2011. He completed his post-graduation from the Indian Institute of Engineering Science and Technology, Shibpur (IIEST, Shibpur) (Formerly, Bengal Engineering and Science University, Shibpur.) in 2013. He has been awarded by Prof. S. C. Dasgupta Gold Medal and Arun Chandra Mitra Memorial Medal for securing highest marks among the candidates of the Master of Science in Applied Mathematics and Master of Science examinations respectively, in 2013 conducted under the Faculty of Basic and Applied Sciences, IIEST, Shibpur. He completed his Ph.D. in "Studies on Differential and Integral Equations in Fuzzy Environment" from the IIEST, Shibpur in 2018. Now he is working as an Assistant Professor at Indira Gandhi National Open University, New Delhi – 110068, India. His areas of research interest are Numerical Analysis, Differential Equations, Integral Equations, Integro-Differential Equations, Fuzzy Mathematics, and Mathematical Biology.

Role of metal-polymer hybrid composites as fillers for reinforcement of epoxy resin and improving its properties

Ramya Rajan, Jayadev D and **Saritha Appukuttan**

Department of Chemistry, Amrita Vishwa Vidyapeetham, India

Epoxy-based nanocomposites represent a distinct category within the realm of polymer composites, occupying a significant place due to their exceptional characteristics. Epoxy-based nanocomposites have been used in several sectors, including as aerospace and automotive, for their protective coating properties, including anti-corrosion and antibacterial functionalities. Additionally, these nanocomposites have also found application in the biomedical area. One notable drawback associated with epoxy materials is to their inherent brittleness, which renders them susceptible to cracking. Nevertheless, the incorporation of diverse fillers into epoxy matrices to form epoxy nanocomposites has been shown to enhance their mechanical properties, therefore enabling them to endure greater levels of mechanical stress. Nanomaterials, fibres, polymers, and particle debris are often used to augment the toughness of epoxy materials[1]–[4].

Our study explores the multifaceted aspects of the hybrid metal-polymer composites when used as reinforcing agent for epoxy resin. These materials exhibit enhanced thermal and mechanical characteristics, while also demonstrating antibacterial properties. This presentation aims to share a novel methodology that exploits the preparation of metal-hybrid polymer composites under photocatalytic condition and employ the combined attributes of metal hybrid polymer composites as reinforcements for matrices composed of epoxy resin to enhance the performance of epoxy resin, hence presenting intriguing prospects for the utilization of advanced materials [5].

Biography

Ramya Rajan is a passionate and dedicated innovation driven professional with 21 years of experience in chemistry research and process development. She began her career as a scientist at Syngene, Bangalore in 2002 and later served as the Research Head for Neucon India in Goa. Joining Syngenta Research and Technology Center in Goa in 2006, she rapidly got promoted to become a Team Leader, dedicating 16 years to the organization. Recently, she embarked on a new role as Team Leader, Process Chemistry at Deccan Chemicals, Goa.

Driven by a profound interest in Nanotechnology and polymer science, Ramya has been a part-time research scholar with Dr. Saritha A, an eminent professor at Amrita University, since 2017, focusing on Nanomaterials. Her expertise spans core chemistry research, including the design and synthesis of biologically active molecules, process development, and PhD research in Nanomaterials. Ramya's contributions have resulted in 6 journal articles, 4 book chapters, and 55 patent applications, with over 200 patents stemming from her work.

She excels in leading cross-functional teams across the entire product development lifecycle, notably achieving successful market launches, such as a broad-spectrum fungicide. Ramya is committed to knowledge dissemination within the chemistry research community, as evidenced by her presentations at various conferences and publications. With a wealth of industry and research experience, she remains dedicated to advancing scientific research.

Energy harvesting by cyclic tensile loading and buckling *via* an electrospun polyblend elastic layer of PVDF/PU

B.Adeli, A.A.Gharehaghaji and **A.A.A.Jeddi**

Department of Textile Engineering, Amirkabir University of Technology, Iran

Energy harvesting through piezoelectric materials is considered an alternative to conventional power sources. Polyvinylidene fluoride (PVDF) is a piezoelectric material that has garnered significant attention from researchers. Blending PVDF with thermoplastic polyurethane can enhance its elastic properties. Numerous studies have successfully generated electric currents from piezoelectric materials by applying pressure and impact. This study, however, explores the generation of an electric current in piezoelectric materials by applying cyclic tensile loading. For this purpose, a tensile loading device was designed and built at the laboratory scale. Subsequently, a PVDF/PU polymer alloy layer (in a 25:75 ratio) was fabricated using the electrospinning method and installed in the loading device for testing. The results demonstrated that the electrical resistance decreased upon applying tension to the layer. Employing cyclic loading on the alloy layer resulted in an output voltage ranging between 3 and 9 mV, which confirmed the feasibility of energy harvesting from the polyblend layer. In a novel approach undertaken in this study, an electric current was generated by applying cyclic tensile loading, resulting in subsequent buckling. The potential energy harvesting mechanism from cyclic tensile loading and buckling is also elaborated. In addition, the study assessed and reported the effect of increasing the cyclic loading frequency on energy harvesting.

Biography

Dr. Behrang Adeli, a native of Khorramabad, Iran, and an alumnus of Amirkabir University of Technology, holding a Ph.D. in Nanotechnology with an emphasis on Nano Fiber and Nano Polymers blending, garnered in 2022. His academic path commenced with a foundation in Textile Engineering from Isfahan University of Technology, where he attained his Bachelor's and Master's degrees in Textile Technology in 2003 and 2007, respectively.

His doctoral research, entitled "Production of PVDF/PU nanofiber layers to investigate the effect of tensile cyclic loading on the electric current generation," underscores his commitment to innovation and advancing knowledge within the field. He has several ISI publications to his credit, reflecting a deep engagement with textile engineering and nanotechnology.

Professionally, he has served as the Direct Manager of Kavosh Novin Sepanta since June 2022 and hold the position of Commercial Manager at Arta Tejarat Zarrin since February 2012. His managerial acumen is further evidenced by his tenure as the Head Manager at Iran Six Stars P.P Bag Weaving Co., as well as his role in production management at Mehrtab Spinning Co.

His technical expertise is broad, encompassing proficiency in Microsoft Office, AutoCAD, MATLAB, and Image processing, alongside programming languages such as C++ and PASCAL. Additionally, he was skilled in statistical software, particularly SPSS and SAS, and graphic software, including Photoshop and Premiere.

Language proficiency in Persian English and a G7 course in German, coupled with his interdisciplinary skills, positions he uniquely within the global academic and professional landscape. His extracurricular pursuits, poetry, painting, and photography, complement his professional endeavors providing a well-rounded persona.

He was particularly proud of the collaborative and teamwork skills honed during his formative years at the Brilliant Talents Schools (Sampad Center), which continue to inform his approach to interdisciplinary research and educational undertakings. His interest in psychology is a testament to his dedication to understanding the human aspects behind technological and scientific advancement.

With a firm belief in continuous learning, he has augmented his expertise through various technical and training courses. These pursuits not only reflect his dedication to personal growth but also his commitment to contributing meaningfully to the sectors he serves.

In summary, his academic qualifications, robust research background, comprehensive technical expertise, and dynamic approach to leadership in textile and nanotechnology industries provide a strong foundation for his ongoing contributions to the field.

Modelling of corrosion rate in the drinking water distribution network using Design Expert 13 software

Reena Singh[2], **Saurabh Kumar**[1] and **Nityanand Singh Maurya**[2]

[1]IIMT University Meerut, India
[2]National Institute of Technology Patna, India

This study focused on the modelling of corrosion rate of the water distribution network of Patna, (Bihar), India using Design Expert 13 software. A total of nine variables, including pH, temperature, total dissolved solid (TDS), alkalinity, calcium hardness, chloride, sulphate, dissolved oxygen (DO), and time, were considered for modelling. The physicochemical parameters were determined through regular monitoring of water samples. The corrosion rate was determined by direct monitoring of water distribution pipes using adjustments of seven GI coupons for 45, 90, 135, 180, 225, 270, and 315 days. Modelling was performed using the low level and high-level experimental range for pH, temperature, TDS, alkalinity, calcium hardness, chloride, sulphate, DO, and time were 7.28, 23, 430, 115, 24, 18, 10.94, 3.5, 0 and 7.86, 28, 704, 284, 180, 98, 38.7, 6.8, and 315, respectively. Using the Box- Behnken design (BBD), 160 runs were conducted, including ten replicates at the central point of each block. The results of ANOVA indicate that values of R^2, adjusted R^2, and predicted R^2 are 0.9714, 0.9507, and 0.8941, respectively. The value of R^2 (0.9714) was close to 1, which indicates a good fit. The adequate precision was found to be 30.8442, indicating a good signal. A coefficient of variance discusses reproducibility, and in this case, it was 9.90%. On the basis of the ANOVA result, the quadratic model is well-fit and can be accepted as a suitable model. A total of seven parameters such as chloride, sulphate, hardness, alkalinity, pH, calcium, and hardness were used for the design of the experimental corrosion rate (CR). These individual CR vs. synthetic aqueous solutions were used to validate the interaction of the response surface. It was found that the trend of individual corrosion rates in synthetic aqueous solutions and the interaction of composite variables with corrosion rates in a quadratic model of response surfaces were clearly correlated.

Biography

Dr. Reena Singh, an accomplished academician, serves as an Assistant Professor at NIT Patna. She has obtained her PhD from National Institute of Technology Patna in 2019 With 15+ years of experience, she's a respected authority with vast expertise. Passionate about research, she published 20+ papers in esteemed journals and presented 15 conference papers, advancing knowledge in her domain. She has submitted two Ph.D and mentoring 7+ research scholars.

Dr. Singh's contributions to literature include five book chapters, showcasing her multidimensional scholarship. As a devoted educator, she inspires and guides countless students, leaving a lasting positive impact on their lives. Her leadership qualities shine through organizing two short-term courses that enrich the academic community. Dr. Reena Singh's remarkable career, scholarly achievements, and impactful mentorship make her a shining beacon in higher education. Her passion for research, dedication to teaching, and commitment to nurturing young minds inspire the future generation of scholars.

Sol-gel synthesis, characterization and luminescence investigation of trivalent rare earth doped garnet phosphor

Anita Verma[1], **Ravi Sharma**[2] and **Vijayalaxmi Biradar**[1]

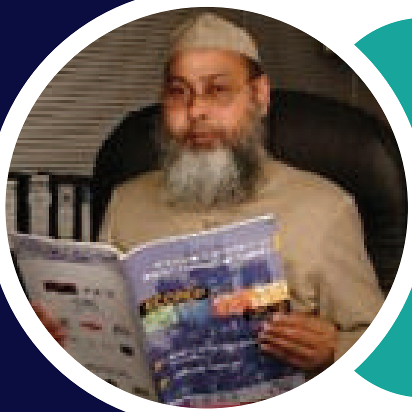
[1]Kalinga University, India
[2]Govt. SGS Girls College Devendra Nagar, India

In recent decades a remarkable evolution has been noticed in the field of optical and luminescent applications using phosphor materials. All phosphor materials have their specific luminescence characteristics and these characteristics basically depend on the activator ion and crystallographic structures of the host lattice. Recently it has been observed that among all the inorganic host materials, garnet is an interesting host material for activator ions due to its eminently good physical, chemical stability, high luminescent effectiveness, high thermal properties and structural flexibility. Trivalent samarium doped $CaY_2Al_4SiO_{12}$ phosphor was prepared via Sol–gel synthesis method for different concentration. X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), energy dispersive spectroscopy analyses (EDS) tool were used to analyse the crystal structure, morphology and elemental composition of prepared samples. Luminescence behaviour of the sample is discussed by the photoluminescence (PL) technique. The prepared phosphor shows a characteristic orange-red emission at around 568 nm with an excitation wavelength of 405 nm. The PL emission spectrum was predominated by an orange - red emission with a highest peak at 568 nm. The most intense PL emission was found for a 3 mol % doping concentration of Sm^{3+} ions. The CIE coordinates reveal that the phosphor has orange-red colour emission on the CIE diagram. Thermo-luminescence (TL) is a technique to investigate the electron traps present in the luminescence material. TL technique has numerous applications, such as in the field of biology, medicine, geology, radiation dosimetry, age determination and solid state defect structure analysis etc. The thermo-luminescence (TL) glow curve is the plot between the TL intensity and the temperature. Each trapping level in the substance can create corresponding TL peaks associated with distinct trapping levels. To analysis these distinct trapping levels deconvolution of TL glow curve is necessary. The computerized glow curve deconvolution (CGCD) investigation has been broadly used to resolve a complicated TL glow curve into separate constituent peaks. To study the TL of the prepared samples, a

^{60}Co- γ (gamma) source was used for irradiation and to determine the trapping parameters such as activation energy (E), order of kinetics (b) and frequency factor (s) of the samples, Chen's peak shape method was used. Results of CIE, colour purity and CCT values support warm appearance (for coffee shops, restaurants etc.) and the potential of this phosphors as an orange emitter in lighting and display devices. Sm^{3+} doped $CaY_2Al_4SiO_{12}$ phosphor showed a very long dose range for γ (gamma) doses and low fading. So it would be used for TL dosimeter application.

Biography

Anita Verma is the Assistant Professor, in the Department of Physics at Kalinga University, Raipur, Chhattisgarh, India. She received her bachelor's degree in Physics from Pandit Ravishankar Shukla University, Raipur, India in 2008. She completed her M.Sc., M.Phil. and Ph.D. in Physics from the School of Studies in Physics and Astrophysics at Pandit Ravishankar Shukla University, Raipur, India in 2023. Since then, she has worked as an Assistant Professor at Kalinga University, Raipur, India. Her investigations are mainly about material science – phosphors, photoluminescence, thermo-luminescence, synthesis methods like sol-gel synthesis, green synthesis etc. So far, she has published over 10 research papers in prestigious journals and international congresses.



Ethylene-alpha olefin elastomers: Liquid phase catalyst active center residential environment and copolymerization microkinetics

Muhammad Atiqullah

Research Institute, King Fahd University of Petroleum & Minerals, Saudi Arabia

The applications of polyolefin thermoplastics have saturated. Ethylene-alpha olefin elastomers are, therefore, gaining more attention. Solution copolymerization processes make such elastomers using alpha olefin-rich comonomer feeds, and metallocene and postmetallocene precatalysts at laboratory to industrial temperatures and pressures. The process needs accurate solubility of ethylene in the solvent-alpha olefin mixture. Hence, this study models ethylene solubility in toluene–1-hexene and *n*-hexane–1-hexene mixtures at the above conditions. The model was developed using Peng-Robinson EoS and *vdW1f* mixing rule, Flory-Huggins interaction parameter, and Shulgin's activity coefficient-Henry's constant formalism. It, unlike those reported in literature, eliminates cumbersome a priori assumptions and iterative calculation of vapor-liquid phase fraction, bubble point, and dew point, and calculation of liquid phase fugacity coefficient. Hence, it is more advantageous. The model-predicted ethylene solubilities in toluene, *n*-hexane, and 1-hexene well match the experimental values at laboratory to industrial temperatures and pressures (Part I).

Part II well predicts ethylene solubility in solvent-alpha olefin mixture using Part I results and correlates the liquid phase mixture fluid compressibility to catalyst active center residential environment. This offers a new approach to investigate catalyst phenomena such as structural effect, activation, deactivation, and stability, as well as *copolymerization phenomena*, for example, monomer saturation and starvation, mechanism and kinetics, monomer reactivity ratios, micromixing effects, etc. Both *phenomena* can be now studied using a common footing. This is the very special contribution of this study to literature.

The current practice of calculating kinetic model parameters, copolymerization reactivity ratios, and microstructural properties and parameters, using (i) ethylene solubility only in the solvent such as toluene or *n*-hexane and (ii) ignoring that in 1-hexene, is significantly erroneous. The present work corrects it and solves a long-standing polymer reaction engineering problem.

Biography

Dr. Atiqullah is currently a Consultant at National Company for Manufacturing Systems (NCMS), Riyadh, Saudi Arabia. He is an Ex-Senior Research Engineer at the Interdisciplinary Research Center for Refining & Petrochemicals (IRCRAC), Research Institute, and a Professor at King Fahd University of Petroleum & Minerals, Saudi Arabia. He chaired the organizing committee of an international materials science conference in 2022. He is Editor-in-Chief at Research and Development in Materials Science Crimson USA. He is a reviewer in 26 ISI journals. He is a recipient of several KFUPM awards. He is the lead inventor of 6 US patents. He has over 50 publications in Q1/Q2 journals. He is a regular keynote lecturer in his research area and a Japan Petroleum Institute (JPI) research fellow. He has successfully managed research projects for BASF The Chemical Company, KACST, SABIC, Saudi Aramco, and Caltech USA. He is a nominee for the international Premier Residency Special Talent Award from Research Development Innovation Agency (RDIA) and King Abdulaziz City for Science & Technology (KACST), Riyadh, Saudi Arabia.

Propagation Impairment in free space Terahertz communication at Sub-Tropical Territories

D. Chakraborty[1] and **M. Mukherjee**[2]

[1]Swami Vivekananda University, India
[2]Adamas University, India

The Terahertz (THz) band (0.1THz-10THz) provides some extraordinary advantages over frequency bands of cutting-edge commercial utility. The non-ionization as well as non-invasive properties, have made THz an astounding topic of today's research, especially in the field of 6G and communication systems with enormous data-rate. But, absorption of THz signal in water is quite high, which, as a consequence, leads to a large degradation of THz signal in moisture (during free space communication of this signal). During its propagation through atmosphere, the THz signal can be severely distorted by the crystalline atmospheric scatterers, where liquid water content is sufficiently high. There are different types of atmospheric aerosols, where Fog is generally treated as the suspended one and Rain is of the falling type. Both of Fog and Rain based atmospheric incidences can degrade the THz link drastically. Depending on the weather constraints (temperate, tropical etc.), the dimensions of the atmospheric aerosols vary also. For the first time, the authors have indigenously developed an experimentally validated non-linear terahertz attenuation model simulator to simulate the terahertz attenuation spectra in tropical fog with varying visibility and in rain with varying rain rates. The fluctuation of refractive-indices of water droplets has been simulated at the early stage. Modified Mie-theory and power-law with weather dependent boundary conditions have been uniquely applied to simulate the THz attenuation spectra in tropical weather scenario. Besides, the scintillation effect in THz wireless communication has also been investigated by the authors' group. It has been found from the indigenous simulator that within 2THz to 4THz regime, the fog-based attenuation of THz signal reaches the peak, while the rain-based attenuation spectra reaches the peak in the range of 7THz to 9THz, under tropical weather situation. To the best of authors' knowledge this is the first report on THz signal degradation due to the presence of atmospheric hydrometeors under tropical climate scenario.

Biography

He had received his M.Sc. degree in Electronic Science from Calcutta University in 2008. After that he had also received M.Tech. degree in Radio Physics and Electronics from the same university in 2010. He has been awarded Ph.D.(Tech.) in Electronics and Communication Engineering from Adamas University, Kolkata, in 2022 and Post-Doctoral degree from DRDO, Ministry of Defence, Govt. of India sponsored project in 2023. He has several publications in SCI journals. He has teaching experience of more than 10years. Presently he is working as a faculty of ECE in Swami Vivekananda University, Kolkata.

Dr. Moumita Mukherjee is alumni of R K S M Sister Nivedita Girls' School - Kolkata, Presidency College and Calcutta University. She received M.Sc. (Physics) with specialization in Electronics & Communication, M.Tech. in Biomedical-Engineering and Ph.D. (Tech.) in Radio-Physics and Electronics (2009), University of Calcutta, India. She did her doctoral & post-doctoral studies under DRDO, Ministry of Defence, Govt. of India. She received 'visiting scientist' & 'postdoc' positions from INEX, Newcastle University, UK & Technical University, Darmstadt, Germany. Dr. Mukherjee was attached with DRDO Centre under Ministry of Defence, Govt. of India (2009-2015) as Scientist (Reader grade). In continuation to that she joined Adamas University and presently working as Professor – Dept. of Physics & Dean (R&D) after completing her terms as Associate Dean & Academic coordinator (2016-2020), Associate Professor (2017-2020) & Assistant Professor (2015-2017), in the same University. With a total seventeen years of R&D and teaching experience, she is Visiting / Adjunct Professor of JAP-BMI under Calcutta University and the West Bengal University of Health Sciences. Her research interest is focused on THz-electronics and communication, Semiconductor devices, Graphene electronics, Photo-sensors, nano-biosensors and Medical Electronics & instruments. She has published more than 150 peer-reviewed research papers, till date, in reputed international refereed journals and reviewed proceedings with citation globally (citation: 900+, h-index: 16). Dr. Mukherjee is member of IEEE, IEEE ED society, life member of IEI, Biomedical Society of India and Indian Science Congress.

The nucleation of crystals in volcanic glass

Galina Aleksandrovna Sycheva

Grebenshchikov Institute of Silicate Chemistry, Russian Academy of Sciences, Russia

Currently, researchers are paying special attention to obtaining a product from natural raw materials. Plasma aggregates, which are increasingly used for the synthesis of silicate melts, are promising methods for producing opaque quartz glass for the production of refractory quartz ceramics. The main advantages of plasma technologies in comparison with traditional synthesis methods are, first of all, a high degree of productivity of technological processes, energy saving and environmental safety. In this paper, we investigated the synthesis features and properties of quartz glass obtained from quartz sand of the Ramenskoye deposit, and also modeled the operation of refractory quartz ceramics made of opaque quartz glass.

The shrinkage rates of quartz glass specimens are estimated. It is well known that the shrinkage in the firing of quartz ceramics is 3.5–5.0%, depending on the density of the raw material. At a temperature of about 1200°C, a slow crystallization process of quartz glass begins with the formation of high-temperature α-cristobalite, which, upon cooling, transforms into low-temperature β-cristobalite. In turn, β-cristobalite, by reducing its volume, weakens the thermal resistance of products. The complexity of this process is that cristobalitization and sintering coincide in temperature. The service process of quartz glass is simulated. The value of the maximum shrinkage increases with increasing temperature. The entire range of investigated temperatures for the primary and refiring of quartz glass can be divided into two quite distinct intervals. The first interval is the average temperature up to 1200°C. Under these conditions, the structure of the glass remains mostly "frozen." In this case, the expansion coefficient in glass is positive and changes relatively little with temperature changes during repeated firing. Fluctuations in the CTLE values and linear dimensions in this area are related to the structure of a particular sample and its internal defects. This temperature range is the most interesting range for most modern practical applications of quartz glass. The second interval is a high temperature interval above 1200°C. In these conditions, the substance is in a metastable state. It exhibits a sharp dependence of the expansion coefficient on temperature with the change in sign approximately in the middle of the interval. For subsequent firing (after the third cycle), the two characteristic intervals are not determined, the change in the length of the sample is insignificant, and the CTE changes only slightly. The X-ray diffraction method in the studied samples recorded the formation of cristobalite, the amount of which increases with increasing temperature and duration of exposure. The maximum value is 23% with isothermal holding for 5 h at 1400°C and 35.5% after 10 heating-cooling cycles up to 1400°C at a heating rate of 2.5°C/min. The rate of change in the linear size and the absolute value of shrinkage increases with the increasing heating rate. The amount of shrinkage decreases with an increase in the number of heating's and with an increase in the amount of cristobalite.

Biography

Galina A. Sycheva in 1972 graduated from the Leningrad Technological Institute (St. Petersburg, Russia), defended her diploma on the topic: "Study of the temperature dependence of the rate of crystal formation in glass in connection with the choice of rational silicate technology" at the Department "Chemical Glass Technology and Glass Ceramics. "She received a specialty - engineer, chemical technologist. In 1987 she defended her thesis on the topic "The origin of crystals in silicate photosensitive glasses. "She works at the Institute of Silicates Chemistry named after I.V. Grebenshchikov of the Russian Academy of Sciences. Currently, Galina A. Sycheva is the head of the laboratory of the structure and properties of glass. In the field of scientific interests are the processes of nucleation of crystals in simple (model) and complex glasses (based on blast furnace slags, natural glasses), as well as the study of the features of crystallization and the properties of opaque quartz glass going to the production of high-temperature quartz keramics.

Effect of printing parameters on the mechanical properties and energy absorption characteristics of 3D printed specimen from Polylactic Acid (PLA) filament

O. K. Ajayi, T. A. Odekomaya and **O. Bayonle**

Department of Mechanical Engineering, Obafemi Awolowo University, Nigeria

Additive Manufacturing (AM) is playing a vital role in the optimization of composite materials for improved mechanical properties. Polylactic acid (PLA), a biomass thermoplastic monomer made from corn starch is the most used filament material in AM, hence the need to carefully explore all parameters that could enhance its performance. In this study, three printing parameters; printing speed, infill density and layer thickness were considered on three levels each. The experimental design was done using the Taguchi L-9 orthogonal array which resulted in a total of 27 experimental sample configurations. Each of the samples were weighed and the time to print each sample was recorded. Tensile test using the universal tensile testing machine (Instron Series 3369 machine) according to ASTM D638 was performed. Force-displacement readings were recorded from which the energy absorption characteristics were determined. Statistical analysis using ANOVA was performed considering the influence of each of the parameters on maximum tensile stress, load at maximum tensile stress and Modulus respectively for each sample. The sample configurations with the highest energy absorption and mechanical properties were analyzed for various applications. The sample with the configuration of Infill density of 15%, printing speed of 70mm/s, and 0.1mm layer thickness exhibited the highest tensile s`trength. However, it was discovered that the infill density has the highest influence on the mechanical properties of the 3D printed PLA material in tensile testing.

Biography

Dr Ajayi has B.Tech, MSc and PhD in Mechanical Engineering. He is currently a Senior Lecturer with the Obafemi Awolowo University, Ile-Ife. His research interests are in Additive manufacturing, robotics, materials optimization and Computer Aided Design and manufacturing. He has initiated, collaborated and published several research works in these areas. He started the additive manufacturing - 3 D printing laboratory in the department and he is the head of the computer aided design and manufacturing laboratory, where he teaches, conduct research works and consultancy with his research students. His efforts in this laboratory have generated a number of products, the most recent being a one-square meter CNC milling/engraving machine for drilling, boring and engraving of woods, acrylic and aluminum materials. As a versatile researcher, he belongs to a number of research groups for collaborative research works in the medical sciences, agricultural sciences, chemistry, biological and space science.

ACCEPTED ABSTRACTS

6th Edition of

Advanced Materials Science World Congress

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Waste glass recycling: The combined effect of particle size and proportion in concrete manufactured with waste recycled glass

Negasi N. Gebremichael, Kazem Jadidi and **Moses Karakouzian**

UNLV, USA

Concrete is the second most used material for construction. Natural or manufactured aggregate and cement are required to produce concrete. Depletion of natural resources has motivated construction industry sectors to look for partial or full replacement of aggregate and cement in concrete. Recycled glass is an alternate candidate for replacing mineral cement, fine aggregate, and coarse aggregate.

In this research, the authors investigated the combined effect of partial replacement of those three components in a single mix over a total of 14 combination trial runs. Grain size and replacement proportion was the major variable in this research.

The results of the investigation presented in this article show that the increase in particle size and replacement proportions of ground waste glass have both positive and negative effects on concrete properties. On the other hand, the durability of concrete manufactured with crushed and ground glass improved as replacement proportion increased while compressive and flexural strength decreased. In addition, replacing a high proportion of cement with ground glass led to a significant decline in concrete properties. However, the results presented demonstrate it is viable to replace cement, fine aggregate, and coarse aggregate with an optimum of 10%, 15%, and 20% of crushed and ground waste glass, respectively, and produce concrete with acceptable fresh, hardened, and durability properties.

Biography

Negasi N Gebremichael, PhD, P.E.

Adjunct Associate Professor, University of Nevada, Las Vegas; gebremi4@unlv.nevada.edu

Engineering Manager, Centurion Consultants Inc; ngebremichael@teamcenturion-us.com

A native of Ethiopia, Africa, Adjunct Associate Professor Negas Gebremichael received a B.S., an M.S.E., and a Ph.D. in Civil and Environmental Engineering from the University of Nevada, Las Vegas. Professor Gebremichael recently joined the University of Nevada, Las Vegas as an Adjunct Associate Professor of Civil and Environmental Engineering and Construction.

He is currently teaching Civil Engineering Materials and Construction Methods and Equipment. His research interests include the investigation of reused concrete and recycled glass in concrete. His research has been featured in Construction and Building Materials. He serves as a voting member of the American Society of Testing and Materials(ASTM), and the International Building Code (IBC).

Doctor Gebremichael has been a consultant to construction firms including private, commercial, and public projects. His interest includes soil, aggregates, concrete, asphalt, and structural steel. Other areas of expertise include geotechnical and material sciences.

Artificial Intelligence (AI) in biomedical engineering

Hossein Hosseinkhani

Innovation Center for Advanced Technology, USA

Application of Artificial intelligence (AI) in biomedical engineering technology is rapidly under development. The way AI applies in biomedical science is as the same as natural living cells consider playing the critical rules in their extracellular matrix environment. The present seminar is divided into two parts; in the first part I will discuss the basic principle of the AI technology. In the second part, I will discuss the recent applications of AI technology in healthcare. I will further show some of our recent project in which AI technology has been used in biomedical engineering including in cancer, diabetes, biosensor, and tissue engineering.

Biography

Dr. Hossein Hosseinkhani, Biomedical Engineer, has 30 years of experience in biomedical engineering in both academia and industry in biomedical engineering research and development, which includes several years of basic science research experience in a number of premier institutions related to the structure and function of biomaterials, and in polymer-based medical implants development in the medical device industry. He is inventor of 22 International patents, several of which are licensed to companies acting in the biomedical fields and translated to 7 commercial products. He authored more than 100 scientific papers published on peer-reviewed Journals, 5 books *(H-index: 49 Google Scholar)*. He is the founder of Matrix HT, Inc. a world leading biotech company dedicated to healthcare technology to improve patient's quality of life.

Study on Raman active vibrations in KTP using TD-CARS technique

Helani Singhapurage, Dinusha Senarathna, Jeremy Sylvester, Chandra Neupane and **Feruz Ganikhanov**

University of Rhode Island, United States of America

Raman spectroscopy is an indispensable tool for material characterization. Yet they have fundamental limitations that need to be addressed. In this work, we have used a three-color time resolved Coherent Anti-Stokes Scattering (CARS) technique to study the decay of Raman active vibrations within Potassium titanyl phosphate (KTP) crystal. The reason why we were interested in KTP was because it has many applications in a vast range of applications. For an example it's a highly non-linear gain medium used for frequency conversion in laser devices.

We use a high-power, high repetition rate Titanium Sapphire oscillator as the main light source and use its mode-locked output to simultaneously pump two parametric oscillators. Our setup is broadly tunable so that it facilitated the detection of Raman active vibrations of a wide range of around 260 to 1070 cm^{-1}. The three-color tunable femtosecond pulses provided detection of phonon decay transients with up to 70 dB signal spans and resulted in the equivalent spectral resolution of better than 0.15 cm^{-1}.

Decay of nine Raman active vibrations assigned to oxide groups of KTP crystal have been directly traced in time with <120 fs resolution. We have been able to detect weak Raman active vibrations and even those which are closely spaced. The Raman active vibrations we traced were in the range 285 – 1030 cm^{-1}. The equilibrium phonon decay rates ranged between 0.93 and 4.25 ps^{-1} yielding in the corresponding linewidths of 4.9–22.3 cm^{-1} for the homogeneously broadened vibrations. We try to explain the range of decays on the theoretical basis of anharmonic crystal potential. We also believe that our work provides important insight on the KTP crystal.

Biography

Helani Singhapurage holds a bachelor's degree in physics (Special) from the University of Sri Jayewardenepura, Sri Lanka. She is currently a PhD student at the department of Physics of the University of Rhode Island, United States of America. Her current research work is focused on non-linear optics and parallel to her role as a graduate student, she teaches elementary labs of Physics as a teaching assistant. Helani's research interests are mainly Optics, Biophysics and her passion for experimental research is open to any opportunities to explore science and nature. Apart from being a passionate young researcher, she is a supportive person in the international student community at the University of Rhode Island. Also, she is a part of the Graduate Student Association and the Graduate Assistant United at the university as a member. Her goal is to be a successful scientist/physicist and to set an example for the women in the STEM.

Knowledge aware emotion recognition via multimodal data analysis

Fatma Najar

John Jay College of Criminal Justice, City University of New York, USA

Emotion categorization plays a vital role in human-computer interaction. For instance, emotion analysis from text has gained increased attention from linguistics, computer science, and psychologists. Text-based emotion recognition is one of the most important topics in the Natural Language Processing research area. For instance, emotions are not expressed only in non-verbal forms but can be communicated through different modalities such as facial expressions, body posture, gestures, and eye gaze. Despite the large range of modalities, most of the research works have focused on recognizing affective states from facial muscle actions (facial action units) or textual features rather than emotions from multimodal displays. Several studies have demonstrated the importance of integrating different modalities for human affect perception. This seminar discusses research on emotion recognition, sentiment analysis, approaches proposed, and performance evaluation.

Biography

Fatma Najar hold two Ph.D. One in Information and Communication Sciences and Technologies from École Nationale d'Ingénieurs de Tunis (2020) and one in Information and Systems Engineering from Concordia University (2022). She received two M.Sc. degrees, a master's degree in Applied mathematics and Computer science from Paris Descartes (2016) and a master's degree in Information processing and computer vision from École Nationale d'Ingénieurs de Tunis (ENIT, 2015). She has a Bachelor of Engineering in Telecommunications from École Nationale d'Ingénieurs de Tunis (2013). She is currently an Assistant Professor at John Jay College of Criminal Justice in the Mathematics and Computer science department. Her research interests lie in the field of information and systems engineering including data structures, artificial intelligence, machine learning, computer vision, emotion recognition, sentiment analysis, fake news detection, social media propaganda, and data quality in engineering.

Artificial Intelligence (AI) in recruitment from the company's Perspective

Piotr Horodyski

ESCP Business School, France

This paper provides insights into AI technology in recruitment from an employer's perspective, based on interviews with managers and employees using various AI-enabled recruitment tools in different organizations, countries, and industries. The study used Kim et al.'s (2007) Value-based Adoption Model (VAM) to examine the factors influencing perceptions of AI tools in the hiring process. The study found that an employer's perceived usefulness, enjoyment, and perceived cost significantly influence the perceived value and adoption of AI tools in the recruitment process. At the same time, it showed that technicality was not causally related to AI's perceived value. The VAM effectively explained the factors influencing perceived value, explaining a significant portion of the variation (adjusted R-squared = 48%). Automating repetitive manual tasks, increasing efficiency, and improving the quality and objectivity of recruitment emerged as significant benefits of AI technology. However, the lack of human judgment and the immaturity of the technology to provide accurate results in complex job search tasks have emerged as the major drawbacks of AI recruitment.

Biography

- 2020-present ESCP Business School/Sorbonne Alliance, Paris, France

PhD candidate

- 2020-2022 ESCP Business School/Sorbonne Alliance, Paris, France

Executive Master’s Degree in Management Research

- 2012 Awarded FCCA status by the ACCA Council, Glasgow, UK
- 2007-present ACCA Member, Glasgow, UK

Became a Charted Certificate Accountant and a full member of ACCA

- 2004-2007 ACCA The Association of Chartered Certified Accountants, Glasgow, UK

Completed the ACCA qualification

- 1999-2000 ESCP Europe School of Management, Berlin, Germany

Dipl.-Kaufmann (European Master Degree)

- 1996-1998 Hamburg University, DAAD Scholarship, Hamburg, Germany
- 1999 Poznań University of Economics, Poznań, Poland

Master Degree in International Affairs and Business Administration

- 1994-1999 Poznań University of Economics, Poznań, Poland
- Business Administration, awarded scholarship for very good academic results

VIRTUAL EVENT

6th Edition of

Advanced Materials Science World Congress

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Chitin membranes and 2D material integration: A NMR study approach

Anjana Aravind and Eike Brunner

TU Dresden, Germany

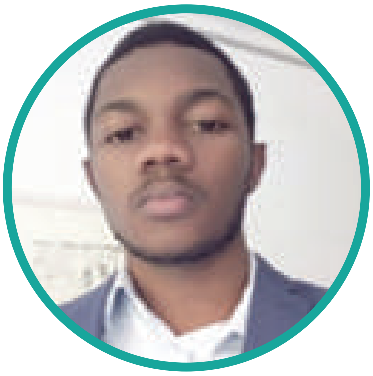
The study's primary focus lies in the conversion of raw chitin into functional chitin membranes, explored through Nuclear Magnetic Resonance (NMR) techniques. Chitin is a versatile biopolymer sourced from crustaceans and has the potential for e.g., advanced energy storage applications. In future investigations, the integration of two-dimensional (2D) materials, particularly graphene oxide (GO), into these membranes is planned followed by NMR characterization.

The first phase of this research involves the conversion of raw chitin into chitin membranes using tailored fabrication techniques. Chitin is extremely stable due to

the presence of acetyl, amino, and hydroxyl groups in the polymer chain and the presence of intermolecular and intramolecular hydrogen bonds make the chitin structure tightly bonded. Therefore, chitin does not dissolve in most regular solvents such as water, organic solvents, and even mildly acidic or basic solution. Due to this processing of Chitin is also challenging. Here we use ionic liquid for dissolving.

The resulting chitin membranes use NMR, to interpret their structural composition, dynamics, and interaction profiles. The research outlines plans for the incorporation of graphene oxide into the chitin membranes to strengthen their potential. The exceptional electrical conductivity and surface area of graphene oxide are expected to enhance charge transfer and storage efficiency. Subsequently, solid-state NMR and *in-situ* NMR techniques will be employed to comprehensively probe the chitin-graphene oxide hybrid membranes. The use of solid-state NMR will help us to understand the molecular arrangement and interactions within the hybrid material.

In summary, this research embarks on a dual-stage journey: first, from raw chitin to functional membranes, extensively studied using NMR techniques; and second, integrating graphene oxide for enhanced energy storage capabilities, followed by comprehensive NMR characterization. By intertwining bioresource utilization, advanced materials, and cutting-edge NMR techniques, this study contributes to the advancement of efficient composite.



Implementing a SWOT analysis for the search for bioactive constituents from Cameroonian medicinal plants previously investigated, in order to promote sustainability: Case of *Erythrina excelsa*

Willifred Dongmo Tékapi Tsopgni[1], Alain Tadjong Tcho[2], Norbert Sewald[3] and **Anatole Guy Blaise Azebaze[1]**

[1]Department of Chemistry, University of Douala, Cameroon
[2]Department of Chemistry, University of Buea, Cameroon
[3]Department of Chemistry, Inorganic and Structural Chemistry, Bielefeld University, Germany

Background: Infectious agents have high adaptability through mutation and are resistant to many types of anti-infectious drugs. Natural products are one of the solutions to tackle anti-infectious drug resistance. Cameroonian rainforest, one of the most diversified ecosystems on earth, have been source of novel molecular structures and biologically active natural compounds. To promote sustainability, the SWOT analysis was implemented in this study, to search for potential anti-infectious leads from previously investigated Cameroonian plants from which bioactive compounds were isolated.

Methods: Compounds were isolated using old and new chromatography techniques; The structure of the isolates were elucidated using spectroscopic and spectrometric techniques. Anti-infectious tests were performed as described in the literature.

Results: A total of twenty compounds were isolated from the bark extract of Erythrina excelsa, including two novel pterocarpan dimers (1 - 2), one new flavanone derivative (3), 3 flavonoids isolated for the first time from Fabaceae family (4 - 6) and 14 known compounds belonging to pterocarpan, flavonoid and phytosterol classes (7 - 14). Abyssinone V-4′ methyl ether (7), a chemotaxonomic marker of Erythrina genus was isolated in the amount of 1.003 g. Of the twenty isolates, MIC values widely ranged from 32.5 – 500 µg /mL were obtained on several bacterial and fungal strains.

Conclusion: This work presented a new approach for the search for bioactive leads. Several potential anti-infectious leads were isolated and the chemical library is increase by three compounds.

Biography

Willifred Dongmo Tékapi Tsopgni, borned on 15 September 1991 at Bafou-Cameroon, West region of Cameroon. Specialist on UPLC-BUCHI installation and training, researcher in drug discovery and bachelor and master students monitor. Member of Yaoundé-Bielefeld Natural Products with Antimicrobial and antiparasite properties project (Funded by DAAD), from June 2017 to December 2018 in Bielefeld-Germany and Cameroon. Member of the laboratory of chemistry of the University of Douala (Since 2015). Author and co-author of 25 publications and many oral presentations in many national and international conferences. Initiator of the project: formulation of an antiCovid-19 phytodrug from antimalarial plants (2020). Actually in Germany at the TUM.

On the concept of Cp parameter and its application in the analysis of scattering phase functions

Guanglang Xu, Martin Schnaiter, Shawn Wagner and **Emma Järvinen**

Karlsruhe Institute of Technology, Germany

In this presentation, I will introduce a mathematical concept called the "Cp parameter". I will explain some theoretical basics of this concept and its role in bridging the gap between measurement and modeling in light scattering by small particles. One of the key highlights of this talk will be showcasing the effectiveness of the Cp parameter in analyzing the scattering phase functions. Specifically, we will focus on a fascinating case study: the "Cp-analysis" on the scattering by a single ice crystal and spherical particle. By studying the relationship between the Cp parameter and other parameters (such as the asymmetry parameter, the first moment of a phase function), we can gain valuable insights into the morphologies of ice crystals. This variation patterns between the Cp parameter and other parameters offers a powerful approach to retrieve valuable information about ice crystal morphology (such as shape and refractive index). Since the concept of a Cp parameter only depends on a positive-defined function on a finite range, the application of the Cp parameter in the analysis of scattering phase functions serves as a compelling example of its potential for advancing various fields of study.

What will audience learn from your presentation?

- The Introduction to the Cp parameter.
- Application of Cp parameter in analyzing data.
- Understanding the relation between Cp parameter and asymmetry parameter.
- Broader implications for research and practical applications.
- The significance of joint efforts in measurement and modeling.

Biography

Dr. Guanglang Xu is currently a postdoctoral researcher at the Karlsruhe Institute of Technology, where he has been actively involved since 2021. He earned his Ph.D. degree in atmospheric sciences from Texas A&M University in December 2017. Following his doctoral studies, Dr. Xu pursued further research as a postdoctoral researcher at the Department of Physics, University of Helsinki, Finland, starting in February 2018. At present, Dr. Xu's research is centered around the fascinating field of light scattering by non-spherical particles. He employs a comprehensive approach that combines both numerical simulations and experimental measurements to gain deeper insights into this intricate phenomenon.

Phase-field-based shape optimization of porous structures

Leonie Wallat[1,2], **Michael Selzer**[3], **Frank Poehler**[1] and **Britta Nestler**[2,4]

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[2]*Institute for Applied Materials - Microstructure Modelling and Simulation, Karlsruhe Institute of Technology (KIT), Germany*
[3]*Institute of Nanotechnology, Karlsruhe Institute of Technology (KIT), Germany*
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Triply periodic minimal surfaces (TPMS) are naturally occurring cellular structures that can be approximated using mathematical formulas. Due to their unique structure and the resulting properties, they are being explored for various applications, ranging from heat exchangers to bone support structures. The diverse range of applications makes these porous structures intriguing for application-specific shape optimization.

In the following presentation, three TPMS unit cells (sheet-based Diamond, Primitive and Gyroid) will be shape-optimized under mechanical compressive loading using the phase-field method. The optimization will take place within the linear elastic regime by minimizing the strain energy density. It is demonstrated that through shape optimization while maintaining the volume and simultaneously preserving the specific shape of the TPMS structures, the effective Young's modulus is increased by at least 20%.

Biography

Leonie Wallat is a research associate at the “Institute of Materials and Processes” and the Institute “Digital Materials Science” at Karlsruhe University of Applied Sciences. Since the end of 2020, she has been engaged in research on TPMS structures.

VIRTUAL EVENT

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Evolution of energy-dispersive XRF-devices for study and preservation of cultural properties

G.E. Gigante[1] and **R. Cesareo**[2]

[1]*Sapienza University of Rome, Italy*
[2]*University of Sassari, Italy*

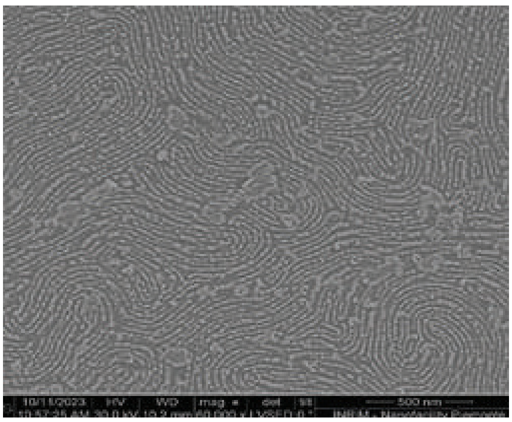
This paper describes the history and technical evolution of portable devices which use energy-dispersive X-ray fluorescence (EDXRF) analysis to study pigments in paintings and elemental compositions of ancient metals. The history starts in 1971 when the first transportable equipment was employed to examine the pigments of Raphael's painting "La Deposizione" during restoration at the Istituto Centrale del Restauro in Rome. Subsequent paintings were analyzed, as well as ancient metals such as bronzes, brasses, gold, and silver. This chapter traces the evolution of the excitation source from radioisotopes to miniaturized, dedicated X-ray tubes, X-ray detectors, from proportional gas counters to Peltier cooled Si-drift, and the developments of pulse height analyzers, from a heavy box to miniaturized electronic circuits included in the detector box. The most "modern" portable EDXRF device is currently composed of a small sized X-ray tube, a Si-drift detector, both properly collimated, and a dedicated PC. The total weight of the device is about 2 kg. Finally, we explore these evolutions in portable XRF devices from the perspective of the analysis of a limited number of points on each work of art through to a complete scanning of a painting. Sophisticated software is required including interfacing mechanics and measuring heads. Maps showing the elemental distribution in the painting "La Fornarina" by Raphael have been obtained using this method.

Diamond patterning employing sequential infiltration synthesis for biosensing applications

Nour-Hanne Amine[1], Irdi Murataj[2], Paolo Olivero[1], Federico Ferrarese Lupi[2] and **Federico Picollo[1]**

[1]Department of Physics, Università di Torino, Italy
[2]Nanoscale science and technology, Istituto Nazionale di Ricerca Metrologica, Italy

Over the past years, there has been significant progress in the sequential infiltration synthesis (SIS) of inorganic materials within nanostructured block copolymer templates, leading to the production of customizable functional nanomaterials [1]. This research aims to employ sequential infiltration synthesis to build a nanopattern on a diamond surface while assessing its electrical properties concerning biosensing applications. One important application of Sequential Infiltration Synthesis (SIS) is the regulated incorporation of inorganic materials into templates for self-assembled block copolymers (BCPs) using polystyrene-block-poly(methyl methacrylate) [2], to create a variety of line/space or hole patterns by orienting them parallel or perpendicular to surfaces. This technique has applications in biology, chemistry, materials science, physics, and materials research. Interestingly, although is widely used on silicon substrates [3], it has not been tested on diamonds. The nanoscale objects are carefully shaped by successive incremental molecular assembly activities. Following surface modification



SEM image of patterned diamond surface after SIS with oxygen plasma cleaning, diamond substrates were subjected to BCP self-assembly. Spin-coated and annealed PS-b-PMMA block copolymer films were used to create self-assembled patterns.

The SIS method [1], combined with oxidizing agents and metal-organic precursors, produced organic/inorganic hybrid compounds. Before being exposed to the metal precursor vapor, BCPs on diamond diffused into films, preferentially interacting with PMMA domains. The polymeric species were eliminated by plasma etching, revealing a metal oxide nanostructure that resembled the BCP template. Surface graphitic electrodes were created by implantation of 50 keV energy and subsequent annealing strategically located at the surface for precise alignment with nanopatterned diamond surfaces. The electrochemical properties of both nanopatterned and non-patterned surfaces were analyzed using cyclic voltammetry and amperometric measurements, allowing for a direct comparison of sensitivity and selectivity in biosensing applications.

Biography

She was Ph.D. student in Chemical and Materials Sciences at the University of Torino in Italy. She started her academic career with a Master's in Materials Sciences and Analytical Chemistry. In addition to her academic endeavors, she has actively looked for chances to use her knowledge in real-world situations. She participated in educational internships, most notably at Fluody Company in Italy, where she explored cyanine dye-related pharmaceutical research and acquired priceless knowledge about the workings of the industry. Additionally, she contributed through an internship at the Istituto Nazionale di Ricerca Metrologica (INRIM) in Torino, Italy, where she developed her abilities to optimize artificial diamond for biosensing applications by nanopatterning its surface with copolymers.

New models of regression learning curve

Vincent Berthiaume

École de Technologie Supérieure, Canada

In machine learning, a regression function has a certain learning curve i.e. the curve of the loss expectation versus the training set size. Experts have conceived different learning curve models used to predict the loss expectation for large intervals of sizes. The problem is that these models are conceived from curves that only have the general aspect of a real learning curve. In this paper, we propose new models conceived from real learning curves. This difference increases the chance for the models to fit better the actual learning curve. For the conception of our models, we used nearest neighbor regression. For the test of our models, we also used nearest neighbor regression.

Biography

Vincent Berthiaume has a master in Electrical Engineering from École de Technologie Supérieure, Montreal, Canada. He is an independent researcher with experience in modeling of machine learning curves, optical character recognition and wavelet transform.

Advancements in anti-blast window technology: The role of carbon nanotube-polymer composites

Mohamed Attia[1], **M.A. Hossain Khandaker**[1], **Stefano Pyrialakos**[2] and **Ioannis Kalogeris**[2]

[1]*Toronto Metropolitan University, Canada*
[2]*National Technical University of Athens, Greece*

This study investigates the enhancement of anti-blast windows, crucial for protecting structures from explosive threats such as terrorist attacks or accidental explosions. The focus is on a novel framing system compatible with the American Institute of Steel Construction (AISC) 360-16 Specifications and the Aluminum Design Manual (ADM) 2020. This system comprises a combination of aluminum 6063-T6 angles and ASTM A36 steel embed plates, connected by spaced bolts and augmented with a carbon nanotube-reinforced polymer (CNT/polymer) gasket. A numerical analysis using ABAQUS software was conducted to evaluate the mechanical behavior of the window assembly under intense blast loads. Special attention was given to the role of the CNT/polymer gasket and the influence of its weight fraction on the structural performance. Results indicated that the inclusion of the CNT/polymer gasket significantly improves the blast resistance of the window frame. This improvement is evidenced by a substantial reduction in stress, deformation, and rotation, along with increased energy dissipation during blast events, compared to configurations without the gasket. These findings offer valuable benchmarks for the proposed structural design and suggest recommendations for its implementation in industrial practices. The study ultimately contributes to the development of more efficient and effective designs for anti-explosion windows that meet industry standards.

Biography

Mohamed Attia is a PhD candidate at Toronto Metropolitan University, currently enlightening students as a Teacher Assistant in "Bridges Design and Construction" and "Structural Analysis." Renowned in the field of structural engineering, he has excelled as an Anti-Blast Designer and Project Manager, managing significant security projects in Europe. His expertise in high-rise building design showcases his proficiency in navigating complex engineering challenges.

Attia holds a Master's degree in Structural Engineering from the National Technical University of Athens (NTUA), Greece, underlining his solid academic foundation. His career is marked by significant contributions to seismic risk assessment and structural optimization, reflecting his ability to blend theoretical knowledge with practical applications. This combination of academic excellence and professional experience positions Mohamed as a key influencer in the structural engineering field, where he is recognized for shaping innovative practices and advancing the industry's future.

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Fracture toughness in aggressive environments: Effect of crack monitoring techniques on test results

F. Oikonomidis

TWI Ltd, UK

There is an industry requirement to generate accurate fracture toughness data for steel and other metals, particularly when they are subjected to aggressive environments. Such data can then be used in understanding the durability of materials in different conditions. The use of clip gauges in aggressive environments limits the range of tests performed by TWI's world-leading environmental testing laboratory. As an ever-growing demand to go deeper for oil and gas, test environments are becoming more severe, meaning that high temperature and high-pressure chambers are required that cannot accommodate a clip gauge. Therefore, TWI is developing the Direct Current Potential Drop (DCPD) approach further and is performing a detailed comparison study to properly understand if the load line displacement indirect estimations are within the level of accuracy suggested by the testing in air standards.

Before embarking on any testing campaign, it has been deemed necessary to conduct a literature review to understand the state of the art methods being applied for testing in aggressive environments Even though the published literature sources in this specialised topic are scarce, the major research trends in the field will be presented and discussed in this paper. The project that is currently in progress at TWI is investigating the effect of the crack monitoring testing methods (DCPD and unloading compliance) on fracture toughness results generated for steel subjected to deaerated seawater under cathodic protection. In addition, the effect of K-rate in fracture toughness tests is also being investigated in the same test environment. The industry standard ASTM E1820 is being used at the core of the research project, even though it has been mainly developed for fracture toughness measurements of metals when they are operating in air. It is expected that the findings of the project will help generate a better tuned testing methodology for the cases where an aggressive environment is present.

Biography

He joined TWI Ltd in Cambridge UK 2012 and have since developed expertise in small and large scale fracture toughness testing in air, seawater, and sour environments. He was also the internal quality advisor of the Materials Integrity & Performance group since 2014. He has supervised postgraduate students in the National Structural Integrity Research Centre in the UK. During the six years before joining TWI, he worked in the area of Fracture Mechanics both in the research Centre OCAS in Belgium and during his 1st PhD at the University of Bristol. He was a chartered mechanical engineer with work experience in the fields of water and wastewater treatment, building services, health and safety and business process management in the aerospace industry. He has served in the Hellenic Air Force and have an MBA degree in general business administration from the University of Hull. He has also obtained his 2nd PhD in Management at the University of Newcastle upon Tyne.

Computational homogenization for macroscopic strength criterion of Fiber Reinforced Material using Polygonal Finite Element Method (Poly-FEM)

Phuong H. Nguyen[1,2]

[1]Dong-A University, South of Korea
[2]International University, Vietnam

This research presents the robust approach to determine the macroscopic criterion for Fiber Reinforced Material (FRM). A representative Volume Element (RVE) is generated to get microscopic and discreted by Poly-FEM. The optimization problem for periodic microstructure is established by the combination of computational homogenization and kinematic limit analysis. The effective macroscopic strength criterion is envelope of the set point from this optimization problem, formulated in the form of conic programming. Various microscopic RVE are examined to study the effects of the plastic behavior of the fiber's geometry and distribution on the macroscopic strength criterion. Results of proposed approach are compared with other numerical solutions.

Biography

Nguyen Hoang Phuong was born on December 16, 1987, in Quang Ngai province, Viet Nam. I graduated in 2013 from Ho Chi Minh city University of technology (HCMUT) for bachelor's and master's degree in civil engineering. I got PhD in engineering mechanics in 2021 from Ho Chi Minh city University of technology and education. From 2015 to 2018, I was lecturer in Nguyen Tat Thanh University, Viet Nam. From 2018 to 2019, I was researcher in HCM City University of Technology (HUTECH). From 2019 to 2022, I was Laboratory technician in International University, Viet Nam. Now, I work as postdoc researcher in Dong-A University, Busan, South Korea

CoZn nanoparticles decorated on Nitrogen doped mesoporous carbon electrocatalyst for efficient oxygen evolution reaction

Sumaira Nazar Hussain[1] and **Nadeem Raza**[2]

[1]*College of Chemistry and Molecular Science Wuhan University, China*
[2]*Institute of Advanced Studies Shenzhen University, China*

The Oxygen Evolution Reaction (OER) is a critical process in electrochemical water splitting for sustainable energy conversion and storage. In recent years, there has been increasing interest in developing efficient catalysts for the OER by incorporating transition metals and heteroatoms into carbon-based materials. In this study, we investigate the OER performance of cobalt (Co) and zinc (Zn) embedded nitrogen-doped mesoporous carbon (ZnCo-NMC) composites. The OER activity of the (ZnCo-NMC) catalysts was evaluated using various electrochemical techniques in an alkaline electrolyte. The results revealed that (ZnCo-NMC) composites exhibited significantly enhanced OER performance compared to pristine NMC and bare carbon materials. The ZnCo embedded NMC demonstrated superior activity with lower onset potential at 10 mA cm^{-2} current density. The introduction of Co and Zn species provides additional active sites for the OER, facilitating the electrochemical reaction. Secondly, nitrogen doping modifies the electronic structure of the carbon matrix, promoting charge transfer and improving catalytic efficiency. Furthermore, the presence of mesoporous carbon framework imparts structural integrity to the ZnCo-embedded NMC composite, effectively preventing the agglomeration or leaching of ZnCo nanoparticles. This characteristic plays a vital role in ensuring the exceptional stability and durability of the composite during prolonged OER operation. By mitigating agglomeration or leaching issues, the mesoporous carbon framework enables the composite to maintain its catalytic activity over extended periods. As a result, ZnCo-embedded NMC emerges as a highly promising catalyst, displaying remarkable electrochemical activity and stability. These advantageous properties position ZnCo-embedded NMC as an attractive candidate for practical applications that demand stable OER performance. Overall, the Co and Zn embedded nitrogen-doped mesoporous carbon catalysts demonstrate promising OER performance. This study contributes to the understanding of transition metal and heteroatom incorporation in carbon-based materials for efficient OER electrocatalysis. Further optimization and exploration of these catalysts hold great potential for advancing renewable energy technologies, such as water electrolyzers and metal-air batteries.

Biography

Dr. Sumaira Nazar Hussain, a distinguished scholar and accomplished chemist, renowned for her contributions to the field of material science and chemistry. She embarked on her academic journey with unwavering determination.

She obtained her Bachelor's degree with honors in Chemistry, igniting her passion for research. Then she pursued a Master's degree, delving deeper into her chosen field. her insatiable thirst for knowledge led me to pursue a Ph.D. in Chemistry, where she conducted pioneering research in the synthesis and characterization of novel Nano-materials and their applications for green energy development from Wuhan University which is a renowned institute of China.

After completing her PhD, she joined Shenzhen University of China as a postdoctoral researcher and continued her research for Electrocatalytic water splitting as well as Nano-Impact experiments. Throughout her career, she has authored numerous research papers, earning recognition for her innovative discoveries and dedication to scientific exploration.

Beyond her research, she was a dedicated educator, mentoring and inspiring young minds to explore the wonders of chemistry.

Experimental verification of a simplified deformation gradient theory

Yucheng Zhou and **Kefu Huang**

Department of Mechanics and Aerospace Engineering, Southern University of Science and Technology, China

In this work, materials with non-local properties are treated as a continuum model composed of micro-elements of a certain volume. Based on this assumption, the deformation and the corresponding energy of the microstructural system are studied in detail, and the equivalent governing equations in simplified form are given. Under the framework of the microstructure system, the micro-strain and micro-rotation of the components are defined from the perspective of deformation, and the simplified deformation gradient theory (SDG) with two length scale parameters is obtained, which has clear physical significance. The introduction of generalized strain energy in the SDG gives a new interpretation of the elastic modulus. We also define the non-local effect parameters to quantitatively capture the non-local properties of the material. Under certain micro-deformation assumptions, SDG can be degraded into coupled stress theory, strain gradient theory and classical continuum theory. Non-local deformation includes two branches: one is the macroscopic deformation of non-uniform materials, and the other is the microscopic deformation of materials with microstructure. For the macroscopic stretching of particle-reinforced composites, SDG successfully verified and predicted the approximate linear relationship between the elastic modulus and the particle size on the micron scale. In addition, the theoretical solution of non-local micro-torsion based on SDG is in good agreement with the experimental results, and the torsion stiffness of the cylinder with a smaller diameter is predicted.

Biography

Yucheng Zhou is currently a research associate at the Technical University of Darmstadt. He has a background in solid mechanics, focusing on nonlocal mechanical behaviors of materials. He received his BS, MPhil and Doctor's degrees in Mechanics from Tongji University (2017), Harbin Institute of Technology (2019) and Southern University of Science and Technology (2023), respectively. His main research interests include microcosmic domain switching process of ferroelectric materials, nonlocal elastic mechanics and peridynamic theory, etc. His latest paper was published in Mechanics of Materials, European Journal of Mechanics - A/Solids and Acta Mechanica.

Fabrication and performance study on ultra-thin carbon fiber electrode and structure battery

Haihong W[1,2], Zhuqing Zhang[1], Xiang Liang[1] and **Liyong Tong[3]**

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[2]Zhengzhou Fangstring New Materials Science and Technology Company, China
[3]School of Aerospace, Mechanical and Mechatronic Engineering, The University of Sydney, Australia

In this article, using ultra-thin nickel-plated carbon fiber woven fabric as a collector, ultra-thin carbon fiber cathode was prepared by coating lithium iron phosphate, and paired with lithium sheet cathode to prepare buckle half-cells, which were tested for electrochemical performance and characterized for microscopic morphology. The test results show that the thinner carbon fiber unidirectional strip has lower ripple degree, which is helpful for the stress reduction of the electrode material coating; the electrode prepared by using carbon fiber as a collector fluid achieves 91% of theoretical discharge capacity and 91.2% of first cycle efficiency of the electrode material. Furtherly, the prepared flexible bendable thin-film battery is integrated in ultra-thin carbon fiber prepreg by winding method, and the structure battery tube is prepared by room temperature curing molding process, and its electrochemical performance is tested. The results show that when the bending load ratio reaches 89.1N/g, the capacitance of the structure battery tube remains above 60%, and the structure battery tube can still work normally after the load is removed. The damage morphology of the structure battery tube and the full carbon fiber tube was analyzed, and the results showed that the structure battery tube may have more advantages than the full carbon fiber tube in absorbing load due to the existence of internal battery.

Biography

Dr. Haihong Wu, Professor of Material Science and Ph.D. advisor at Henan University of Technology. Professor Wu is the head of the International Collaboration Laboratory for Carbon-Fibre Reinforced Composite Materials, council member for SAMPE, R&D consultant of Zhengzhou FangString New Material Technology Co., Ltd. In recent years, she has successively conducted the projects of the Ministry of Aymy Equipment Development, the general projects of the National Natural Science Foundation of China, and key projects; Major R&D plans of the Ministry of Science and Technology; Zhengzhou Innovation Team Project; Major projects in Zhengzhou; There are more than 20 horizontal entrusted projects of enterprises. It has nearly 20 national authorized invention patents for the preparation of ultra-thin carbon fiber prepreg tape and composite materials, and 3 industrial application transformations.editorial board member for "Aviation manufacturing technology", and has been the principle investigator of numerous nationally and regionally funded research projects.

Advances in sewage sludge application and treatment: Process integration of plasma pyrolysis and anaerobic digestion with the resource recovery

Ndungutse Jean Maurice[2], **Abdulmoseen Segun Giwa**[1], **Ai Luoyan**[1], **Xinxin Liu**[1], **Yang Yunlong**[1] and **Zhao Hong**[3]

[1]*School of Environment and Civil Engineering, Nanchang Institute of Science and Technology, China*
[2]*Institute of Environmental Science, Shanxi University, China*
[3]*Jiangxi Transportation Institute Company Limited, China*

Sewage sludge (SS) is an environmental issue due to its high organic content and ability to release hazardous substances. Most of the treatments available are biological, thermal hydrolysis, mechanical (ultrasound, high pressure, and lysis), chemical with oxidation (mainly ozonation), and alkali pre-treatments. Other treatment methods include landfill, wet oxidation, composting, drying, stabilization, incineration, pyrolysis, carbonization, liquefaction, gasification, and torrefaction. Some of these SS disposal methods damage the ecosystem and underutilize the potential resource value of SS. These challenges must be overcome with an innovative technique for the improvement of SS's nutritional value, energy content, and usability. This review proposes plasma pyrolysis and anaerobic digestion (AD) as promising SS treatment technologies. Plasma pyrolysis pre-treats SS to make it digestible by AD bacteria and immobilizes the heavy metals. The addition of Char to the upstream AD process increases the quantity and quality of biogas produced while enhancing the nutrients in the digestate. These two processes are integrated at high temperatures, thus creating concerns about their energy demand. These challenges are offset by the generated energy that can run the treatment plant or be sold to the grid, generating additional cash. Plasma pyrolysis wastes can also be converted into biochar, organic fertilizer, or soil conditioner. These combined technologies' financial sustainability depends on the treatment facility's circumstances and location. Plasma pyrolysis and AD can treat SS sustainably and provide nutrients and resources. This paper explains the co-process treatment route's techno- economic prospects, challenges, and recommendations for the future application of SS valorization and resource recovery.

Fabrication of sub-50 nm core-shell nanoparticles for cell imaging and targeting therapy

Jian-Bo Qu, Gang-Feng Li and **Xue-Fei Zhang**

China University of Petroleum (east china), China

Generally, particles in the size range of 20−200 nm have long blood circulation ability by escaping from the recognition of reticuloendothelial system, and they prone to accumulate at tumor sites via the enhanced permeability and retention (EPR) effect or targeted ligand conjugation. In particular, particles with diameter less than 100 nm are more suitable for cellular uptake than that of 200 nm, and can even overcome the blood–brain barrier. Polymer nanoparticles (NPs) have found great potentials in biomedical fields due to the versatility of polymers, including targeted drug and gene delivery, bioimaging, and biosensors, etc. Among them, core-shell NPs have several advantages over simple NPs leading to the improvement of properties such as better dispersibility and biocompatibility, less cytotoxicity, easier conjugation with bioactive molecules, increased thermal and chemical stability and so on. Therefore, they are more promising for biomedical applications than single NPs. However, most core–shell NPs were typically synthesized by "grafting from/to/through" strategies, which are complicated and laborious, usually resulting in the heterogeneous shell of particles. For most drug delivery systems, moreover, their drug release are dominated by diffusion and therefore difficult to realize rapid release at tumor site.

To circumvent these problems we have recently developed a novel strategy for the fabrication of several sub-50 nm core-shell NPs with cross-linked cores in one-pot for targeted drug delivery, which demonstrated the rapid release of payloads at the tumor site by incorporation of targeting ligand, pH responsiveness, pH/GSH responsiveness, and squeezing effect. We also synthesized inherently fluorescent sub-50 nm core-shell NPs for hepatocellular carcinoma cells imaging and targeting therapy. In summary, the platform as proposed would be promising in targeting the therapy and imaging of hepatocellular carcinoma.

Biography

Dr Jian-Bo Qu obtained his PhD in 2009 from Institute of Process Engineering, Chinese Academy of Sciences. From 2015 to 2016, he worked as a visiting scholar at the University of New South Wales under the supervision of Prof. Martina Stenzel. He is now a full professor in College of Chemistry and Chemical Engineering, China University of Petroleum (east china). In terms of part-time work, he is member of the Chinese Chemical Society and communication evaluation expert of the National and Some Provincial Natural Science Foundation, reviewers for various international journals such as Macromolecules, Analysis Chim Acta and J Chromatogor A. He has headed up more than 15 projects, including 3 general projects funded by the National Natural Science Foundation of China. His expertise and main research area focus on development and application of high-speed separation medium, hemoperfusion materials and functional nanomaterials. He has published 50 peer reviewed papers, one book, one textbook chapter and 10 patents.

Recent advances of magnetic gold hybrids and nanocomposites, and their potential biological applications

Mirza Muhammad Faran Ashraf Baig

The Hong Kong University of Science and Technology, China

Magnetic gold nanoparticles (mGNP) have become a great interest of research for nanomaterial scientists because of their significant magnetic and plasmonic properties applicable in biomedical applications. Various synthetic approaches and surface modification techniques have been used for mGNP including the most common being the coprecipitation, thermal decomposition, and microemulsion methods in addition to the Brust Schiffrin technique, which involves the reduction of metal precursors in a two-phase system (water and toluene) in the presence of alkanethiol. The hybrid magnetic–plasmonic nanoparticles based on iron core and gold shell are being considered as potential theragnostic agents. Herein, in addition to future works, we will discuss recent developments for synthesis and surface modification of mGNP with their applications in modern biomedical science such as drug and gene delivery, bioimaging, biosensing, and neuro-regenerative disorders. I shall also discuss the techniques based on my research related to the biological applications of mGNP.

Biography

His research work mainly focuses on the construction and function of DNA nanomachines, which are cutting-edge and challenging topics. He designed and constructed unique DNA motifs using a short circular DNA nanotechnology technique and functionalized these probes with fluorophores, gold nanoparticles, small molecular drugs, and peptide ligands. To achieve plasmon resonance effects, He achieved nano-specific precision in organizing plasmonic nanoparticles on the nano DNA frameworks. His work on the DNA nanomachines provided an efficient fluorescence resonance energy transfer mechanism that realizes the bio-imaging, detection of biological events, and functions of the biomolecules. He has also been working on multilayered hybrid magnetic nanoparticles for applications in nanomedicine for the last three years.

Bright morning lighting enhancing parasympathetic activity at night: A pilot study on elderly female patients with dementia without a pacemaker

Chuen-Ru Liu[1], **Terry B. J. Kuo**[2], **Jwo-Huei Jou**[3], **Chun-Ting Lai**[2], **Yu-Kai Chang**[5] and **Yiing Mei Liou**[2]

[1]*Taipei City Hospital, Taiwan*
[2]*National Yang Ming Chiao Tung University, Taiwan*
[3]*National Tsing Hua University, Taiwan*
[4]*National Taiwan Normal University, Taiwan*

Objective: Exposure to bright morning light (BML) entrains the master circadian clock, modulates physiological circadian rhythms, and reduces sleep-wake disturbances. However, its impact on the autonomic nervous system at night remains unclear. Here, we investigated the effects of BML exposure on parasympathetic nervous system (PSNS) and sympathetic nervous system (SNS) activity at night in elderly women.

Scope: Recruitment was carried out in communities and nursing homes in Taiwan from April to December 2019.

Methods: This nonrandomized controlled pilot study included female participants aged ≥60 years who were diagnosed with a type of dementia or cognitive disorder, excluding individuals with pacemakers. The treatment group was exposed to 2500 lx of BML, whereas the control group was exposed to 200 lx of general lighting. We measured heart rate variability to quantify ANS activity.

Results: The treatment group displayed significant increases in high-frequency (HF) power (Roy's largest root=1.62; P<.001) and nonsignificant decreases in normalized low-frequency (LF%) power. The corresponding nonsignificant decreases in low-frequency/high-frequency (LF/HF) ratio and cognitive function were correlated with PSNS activity (Roy's largest root=1.41; P<.001), which improved severe dementia.

Conclusion: BML exposure reduced SNS activity and enhanced PSNS activity at night in female participants, which improved cognitive function. Thus, BML therapy may be a useful clinical tool for alleviating cognitive decline.

We have found the solution to turning stable and regular rhythmic sleep patterns, improved sleep quality at night

Biography

She was a Ph.D. candidate at the Department of Nursing, National Yang Ming Chiao Tung University, and a clinical nurse at the Nursing Department of Taipei City Hospital, Songde Branch, Research Interests: How to improve sleep disturbance in dementia. It is well known that with the aging of the population, the number of people with dementia has been increasing year by year and has now become a worldwide phenomenon. As a result, dementia-related health issues have become a high priority. Efforts are being made to improve the sleep of the elderly with dementia through non-pharmacological alternatives, including the provision of bright light therapy model intervention and sleep hygiene educational training on the part of dementia care professionals or skilled.

Wear of titanium *In-Situ* composites Ti–Si–Zr under different experiment conditions

K. Grinkevych[1,2], **I. Gorna**[1], **K. Valuyskaya**[1] and **S.O. Firstov**[1]

[1]*Frantsevich Institute for Problems of Materials Science, NAS of Ukraine, Ukraine*
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Titanium alloys are finding increased application in various industries as structural materials. But their applications are known to be significantly limited by low wear resistance. An alternative method to increase the tribology properties of titanium alloys is to produce alloys with heterogeneous structures. The natural (*in situ*) composites Ti-Si-Zr, resulting from the crystallization of eutectic alloys under conventional casting, have such a structure [1].

The tribological properties of Ti–Si–Zr alloys were studied in different friction conditions. Tribological tests were performed with two methods. The samples were subjected to shaft–bush (counterface–material) tests by dry friction against 52100 steel, employing an M-22M machine at a load of 20 N and a 1–6 m/sec sliding speed with one method. The other method involved quasistatic and dynamic sphere–plane tests with an effective load of 30 N employing tribology complex [2]. The indenter materials were 52100 steel and Si3N4 ceramics. The tests were performed at a water sliding speed of approximately 0.0147 m/sec. The linear and weight wear rate for the cast Ti–10Si–10Zr–1Sn sample with a superfine eutectic structure determined with the first method at the greatest test speed (6 m/sec) was found to be 1.4 times higher than that of the Ti–9Si–7.6Zr alloy. The Ti–10Si–10Zr–1Sn alloy showed the lowest wear resistance under quasistatic and dynamic loads with the second method, regardless of the indenter material (52100 steel or Si3N4). Contrastingly to the previous data for cast irons and steels [3], the eutectic Ti–Si–Zr titanium alloys for the first time showed more minor wear under dynamic loading than under quasistatic loading. Thermomechanical treatment of the hypoeutectic Ti–9Si–7.6Zr alloy was established to increase its wear resistance by more than 1.6 times.

Biography

Kostyantyn E. GRINKEVYCH, Ph.D. in Friction and Wear in Machines, is the leading scientist and the head of the tribology group at the Frantsevich Institute for the Problem of Materials Science (IPMS NASU) in Kyiv, Ukraine. https://orcid.org/0000-0001-8305-7894

Dr. GRINKEVYCH's research interests include Materials Science, Tribology, Friction and Wear in Machines, Tribotechnology, Tribodiagnostics Stimulated by Dynamic Loading, Tribochemistry, and Advanced Nanolubrication.

Dr. GRINKEVYCH received a Dipl. Engineer degree from Moscow Institute Steel and Alloys (MISIS) in Moscow, Russia (1987). Then he come back to Kyiv and worked at the IPMS NANU as a researcher in Tribology, Materials Science, and the Creation of superlubricity and piston materials and developed the tribology complex (CATC) as well.

He earned his Ph.D. at National Aviation University in Kyiv (2004) and was awarded the academic title of Senior Fellow in Material Science (2007) and Chair Professor at the Harbin Institute of Technology (2016). He has also been a Docent at the "Igor Sikorsky Kyiv Polytechnic Institute" and an Invited Professor and Expert at Dalian Maritime University, China. Dr. GRINKEVYCH has published more than 150 publications and has been awarded 12 patents

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Influence of high hydrostatic pressure post treatment on Vickers hardness and Co phase structure of WC-Co cemented carbides

V. Sheremet[2], I. Andreev[3], P. Loboda[2], I. Trosnikova[2] and **G. Akimov[1]**

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[2]National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Ukraine
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Cemented carbides are widely used for the production of cutting tools and as a structural material. It is necessary to understand how the properties of such materials can change after the material is exposed to extreme conditions. A large number of experiments have been carried out to study the effect of cryogenic treatment on the properties of WC-Co cemented carbides. Cryogenic treatment initiates martensitic phase transition of Co from face-centered cubic (FCC) to hexagonal closepacked (HCP). This work demonstrates the results of a first-time experimental study of the effect of high hydrostatic pressure (HHP) of 400 MPa on the properties of WC-3 wt.% Co and WC-15 wt.% Co cemented carbides. Two series of samples were prepared using conventional technology; after sintering, the samples were ground and polished. One series was treated with 400 MPa HHP in a multiplication type high pressure equipment by compressing transmission oil in a high-pressure chamber. The second series was not processed. After that, samples of both series were investigated by using X-ray diffraction (XRD), scanning electron microscope (SEM) and Vickers hardness test. After HHP treatment, the hardness of WC-3 wt.% Co decreases by 8%, and WC-15 wt.% Co by 10%. It was established for the first time that the HHP treatment promotes the phase transition of Co from FCC to HCP.In WC-3 wt.% Co samples processed by HHP the proportion of HCP Co phases increased from 30 to 54%. In WC-15 wt.% Co samples processed by HHP the proportion of HCP Co phases increased from 30 to 85%. In addition, the WC grains in the Vickers indenter prints in the samples processed by HHP were abundantly cracked. The discussion of the results is based on the fact that the compressibility of Co ($K_{exp.}$ = 6.0*10^{12} Pa-1) is more than twice as high as the compressibility of WC ($K_{exp.}$ = 2.5*10^{12} Pa^{-1}).

Biography

He was a PhD student at National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", and have been doing research in powder metallurgy field. His research is focused on the application of Cold Isostatic Pressing in the production of cemented carbides.

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Fluid dynamics application for supersonic nozzle calculation in the production of fine tool steel powders

D.M. Fedorov, K.O. Gogaev, O.K. Radchenko and **Yu.V. Kolesnichenko**

Institute of Material Science of Ukrainian National Academy, Ukraine

The production of powders with predetermined particle sizes is an important task in various branches of powder metallurgy and is especially relevant in additive manufacturing, where powders with an equivalent particle diameter smaller than 50 μm are used. Fluid dynamics methods, being widespread in aviation engineering, were used to calculate the nozzle for practical atomization of the molten 10R6M5 tool steel. With the variation of gauge gas initial pressures from 0.5 to 2.0 MPa, the following parameters were calculated in the paper: theoretical gas flow speed to produce particles of required size by gas atomization of superheated molten metal; specific flow rate of the metal flowing out of the metal tundish, and atomization nozzle parameters (such as critical and outlet cross-sectional areas and their ratio). The graphical illustration shows the theoretical jet speed allowing fine powders with a particle size of less than 50 μm to be produced. The inert gas jet parameters along the nozzle profile and outlet parameters were calculated depending on initial gas pressure and temperature before the nozzle using a special Excel program. The supersonic nozzle with a fixed geometrical dimension and supersonic gas jet are very sensitive to initial pressure variation before the nozzle. It was shown the difference in jet behavior at the initial pressure below and above the nominal pressure for the calculated regime. The effect of gas preheating before the nozzle on the jet parameters is shown too. The following parameters for the production of 10R6M5 tool steel powders with a particle size smaller than 50 μm by gas atomization were established: Initial Pressure above 16.8 MPa, Initial temperature 293K, gas jet speed at the nozzle outlet of 525 m/sec, temperature of –140°C.

Biography

Dr. Dmytro Fedorov is a retired senior scientist of the Ukrainian National Academy of Science. His interest is metal powder production by hydrogen reduction of metal oxides and by atomization of the melts. He is a practical researcher, who implemented scientific ideas into the industry. 50 scientific publications reflect this experience, including 12 patents on inventions, confirmed by Ukraine, India. The conference paper "Theoretical advantages of hot gas atomization of melts" got the Indian National award after prof. Tendulkar for the best scientific paper. He has 30 years of experience in metal powder production. His practical industrial experience includes implementation of iron powder production by atomization at "Severstal", Cherepovets 1992-1997, iron powder production by hydrogen reduction at NMDC, Hyderabad, India 2006-2012, collaboration with Ukrainian metal powder plant at Brovary. He has connected with Indian research organizations during 20 years, so he is a life member of the Indian Powder Metallurgy Association.

Processability for laser powder bed fusion of metallic allys

Homero Alberto Castro-Espinosa[1] and **Leopoldo Ruiz-Huerta**[2,3]

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[3]*National Laboratory for Additive and Digital Manufacturing, MADiT, Mexico*

Processability is critical for determining the cost and efficiency of any material from its raw material to the final product. It refers to the ease of achievement of the required processing schedules. However, processability has yet to be fully defined for Laser Powder Bed Fusion. In order to widespread the use of Laser Powder Bed Fusion in medical, automotive, and aeronautical industries, processable alloys with outstanding performance are demanded.

On the other hand, there is variation in final Laser Powder Bed Fusion components characteristics attributed to a wide range of process parameters and powder material characteristics employed by each machine brand. These characteristics are mechanical properties, build rate, surface roughness, dimensional accuracy and manufacturability. This variation is holding back the adoption of this technology at the industrial level.

Hence in this work processability quantitative measure is proposed for Laser Powder Bed Fusion. Through the conditions process parameters and powder material characteristics generate the melting pool (alloy powder melting point achievement) and meet melting bonding criteria in a certain build rate.

Results show that there is a wide option of process parameters and material conditions that generate a suitable processability interval in different build rates, thus it is necessary to find out the adequate combination that generates the best mechanical performance without compromising relative density and to speed up build rate.

Biography

Dr. Homero Alberto Castro Espinosa graduated at Universidad Nacional Autónoma de México. He obtained his master's degree at the same university. His Ph.D. dissertation focusses on the study of processability and manufacturability of additive manufacturing porous structures through laser powder bed fusion (L-PBF). His research interests are additive manufacturing, mechanical design, mechanical performance, and lightweight structures.

The zeolite structure absorbers for a hydrogen storage

Mukhammad-Sultan Payzullakhanov, Odilxuja Parpiev and **Olim Ruzimuradov**

Institute of Materials Science, Uzbekistan

The processes of hydrogen absorption in porous ceramic materials have been studied. A review of data on the production and storage of hydrogen in materials of various structural states is provided. The main approaches to solving the problem of hydrogen storage in general are presented. The main modern methods of storing hydrogen in various states of aggregation are described. In particular, methods for storing hydrogen in burnt form at low temperatures are analyzed; in chemically bound form - in metal hydrides. The results on the synthesis of porous materials for use in hydrogen absorbers are presented. Various types of hydrogen absorption into porous materials under given conditions - temperature and pressure - have been proposed. Absorbers with a high hydrogen absorption value of 13.2 wt.% were obtained.

Biography

Professor (Ph.D.-physics), head of laboratory of the Material sciences institute of Uzbekistan academy of sciences. He got his Specialist in solar energy engineering and material sciences Philosophy Doctor's degree (Ph.D.) at Nuclear physics Institute. Currently Dr. Mukhammad-Sultan Paizullakhanov s' researches focus on the use of concentrated solar energy use in the material sciences.

Methodology of forming the objective function and solving optimization problems of methods and devices for measuring thermophysical properties of substances

S.V. Ponomarev

Tambov State Technical University, Russia

Tambov State Technical University has accumulated experience in designing methods and devices for measuring the thermophysical properties of substances (TPS) based on solving optimization problems using objective functions, for which it is recommended to use the following methodology:

1. In the form of a diagram (or drawing), it is necessary to present a physical model of the device for the implementation of the projected and developed method of measuring the TPS of substances;
2. Using methods of mathematical physics it is necessary to write down the statement of the direct boundary value problem of thermal conductivity describing the temperature field inside the material sample during the experimental measurement of TPS;
3. By solving the direct boundary value problem of thermal conductivity, it is necessary to obtain its analytical solution in the form of formulas that allow calculating the temperature field inside the sample of the material under study;
4. Based on the obtained solution of the direct boundary value problem of thermal conductivity, it is necessary to obtain formulas for calculating the TPS from experimental data determined during the measurement of these TPS;
5. Using the obtained formulas for calculation of the desired TPS (by applying methods of mathematical metrology and error theory) - it is necessary to obtain objective functions (in the form of formulas for calculating the root-mean-square (RMS) estimates of the relative errors of indirect measurements of the TPS);
6. In the future, these formulas (for calculating the RMS estimates of the relative errors of indirect measurements of the desired TPS) are used as objective functions in

the mathematical modeling of measurement errors of TPS and solving optimization problems of methods and devices for measuring the desired TPS; as a result of solving the optimization problem, as a rule, the best values are determined (ensuring the minimization of measurement errors of the TPS of the measured substances and materials) including: a) the operating parameters of the measurement process; b) the main structural dimensions of the measuring device; c) the parameters of the applied algorithm for processing experimental data;

7. Taking into account the results of solving the optimization problem, practical recommendations should be formulated for the implementation of both the operating parameters of the developed new method of measuring TPS, and the basic structural dimensions of the device for implementing this method; as a rule, these formulated practical recommendations can be used as a basis for recording the claims and subsequent filing of an application for an invention in order to protect the results of the research with a patent.

The report will give an example of the application of the methodological recommendations formulated above, used in the development of the method of a flat pulsed heat source.

Biography

Sergey Vasilyevich Ponomarev (24.10.1949), Candidate of Technical Sciences (1979), Associate Professor (1981), Doctor of Technical Sciences (1995), Professor (1996). Honored Worker of the Higher School of the Russian Federation (2001).

After graduating from the Tambov Institute of Chemical Engineering (1972), he works at the Tambov State Technical University.

Member of scientific organizations: All-Russian Organization "Thermophysical Properties of Substances" (1995), Russian Academy of Metrology (1996), All-Russian Quality Organization (2005).

Research area: instruments and methods of thermophysical measurements; optimization methods and theory; quality management of processes and products; quality management systems.

Co-author of about 600 publications and inventions, including 1 textbook, 21 study books, 16 monographs).

Mathematical modeling of a thermal converter with a cylindrical heat conductor and with a local heat source chosen on the basis of the scientific problem

P.M.Matyakubova and **P.R.Ismatullaev and N.I.Avazova**

Tashkent State Technical University, Uzbekistan

The paper deals with the issues of the functional diagram and justification of the efficiency of thermal converters for controlling the moisture content of the flow of liquid materials. In addition, two main types of physical models were identified in the work based on a pipeline section with radial holes, in which cylindrical probes with heating and temperature-sensitive elements are located across the flow of liquid material: with concentrated and distributed heat sources.

1. Based on the analysis of a generalized functional diagram and justification of the effectiveness of thermal converters for monitoring the moisture content of liquid materials, as well as on the basis of a pipeline segment with radial holes in which cylindrical probes with heating and temperature-sensitive elements are located across the flow of liquid material, two main types of physical models are identified: and distributed heat sources.
2. A mathematical model of thermal converters of moisture content of liquid materials with cylindrical heat pipes with concentrated and distributed heat sources based on matrix methods of thermal quadripoles has been obtained and analyzed.
3. It is shown that for the development of designs of thermal converters of moisture content of liquid materials, the most suitable are thermal systems with distributed heat sources based on a segment of a pipeline with radial holes in which tubular probes with cylindrical temperature-sensitive elements are located across the flow of liquid material, on the surface of which a heating winding is wound. element, which significantly increases their sensitivity, speed and reliability allows the use of standard semiconductor temperature-sensitive elements.
4. The obtained mathematical models of thermal converters with concentrated and distributed heat sources were analyzed and experiments were carried out, their suitability for analyzing the main characteristics, as well as for developing a methodology for designing thermal converters for moisture content of liquid materials, was revealed.

Biography

Matyakubova Parakhat Meyliyevna, doctor of technical sciences, professor Born in 1960 in Urganch, Khorezm region. She graduated from the Tashkent Institute of Electrotechnical Communication in 1985, majoring in "Automatic Electrical Communication". She started his career in 1983 as an engineer of the Communications Department of Urganch city, Khorezm region. Since 1991, she worked as a senior teacher and associate professor at Urganch State University, and later as an associate professor and scientific secretary at the Urganch branch of Tashkent University of Information Technologies. In 2010, she worked as an associate professor of Tashkent State Technical University, since 2012, as a professor of this educational institution, since 2013, as the head of the department. Parakhat Matyakubova trained many students in the fields of metrology, standardization and product quality management, technical regulation, and achieved scientific achievements together with them. She won prizes in several international competitions. In particular, she regularly participated in the "KIWIE - 2018", "KIWIE - 2019", "KIWIE - 2021", "KIWIE - 2022" exhibitions held in the Republic of South Korea on behalf of women inventors of the Republic of Uzbekistan, and won a 4-time gold medal and a grand prix in 2021. was In addition, she participated in "The 4th International Invention Innovation competition in Sanada, ICAN 2019 Toronto International Society of Innovation and Advanced Skills (TISIAS) ICAN 2019" - the 4th International Invention Innovation competition held in Toronto, Canada, and won the gold medal and was recognized as "Expert of the Year". Under her leadership, memorandums were signed with higher education institutions in Russia, South Korea, Germany, Canada, Belarus, Ukraine, Latvia, the United States of America, France, Kazakhstan and Turkey. She is also preparing educational and methodological complexes in cooperation with foreign scientists.

Peculiar properties of a low-dimensional system with high polarizability: Excited states and superconductivity

Yu.N.Moiseev

Department of Physics, Moscow State University, Russia

A low-dimensional system with a high polarizability-LB film of an ion-exchange polymer on the graphite surface-was studied by the STS method. At room temperature, the zero-bias conductivity peak (ZBCP) was observed, as well as excited states (stationary and non-stationary) on the surface of the film. At 77 K, besides of the conductivity peak a BCS-like gap was observed. Splitting of ZBCP was observed in the magnetic field. All these phenomena are likely to have a common cause, namely, they are a manifestation of coherence in the interaction of electrons with the medium. It may also be a manifestation of superconductivity in this system, even at room temperature.

Biography

In 1981 enetered the Faculty of Physics of the Moscow State University. In 1987 graduated from the university and was proposed to continue research studies at the Faculty of Physics. In 1993 awarded Ph.D degree.

Research Interests: Tunneling and AFM-microscopy and spectroscopy, physics of low-dimensional systems, superconductivity

New rotation electron-diffraction methods and their applications

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[2]*Russian Academy of Sciences, Moscow*

By tilting and rotating a thin single-crystal film (TSCF) in various ways (TSCF lies exactly on the plane of the crystal holder), we obtain an electron diffraction pattern of the type of lamellar oblique textures and acicular textures (Fig. 1a) . From the reflections h00 we determine the value of the parameter a of the crystal lattice, and from the reflections 10l the value of the parameter c. By the distribution of reflections 11l, we determine the thickness of the package (layer, structural unit), and by the value of the second strong reflection (in this case, 116) in this series, we establish the structural type.

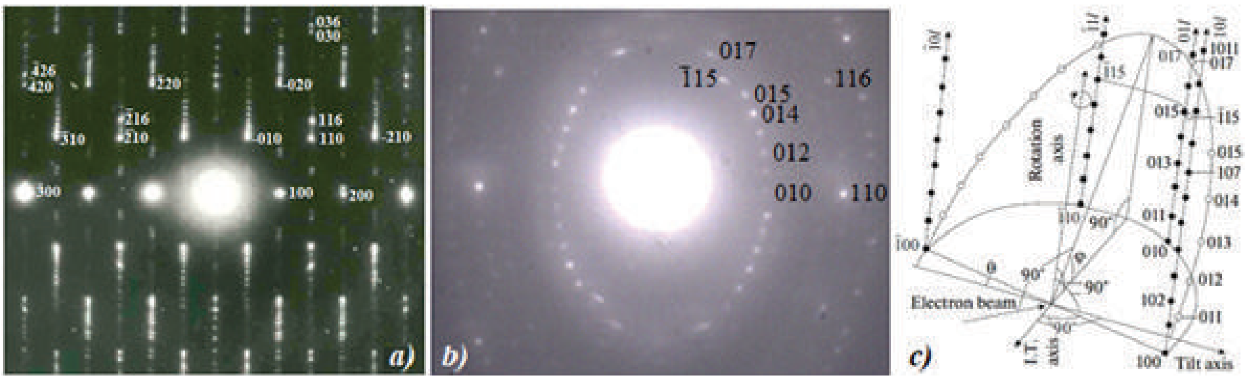

Figure1. *a) electron diffraction patterns of the CdInGaS4 single-crystal thin films, imitating electron diffraction patterns of acicular texture, b, c) 2H-polytype Mg0.7Ga1.4In0.8S4 (= 35°, ω = 60°) single crystal: b) rotation electron diffraction pattern(= 35˚, ω = 60˚) and c) scheme of rotation and detection of sites (and, consequently, reflections) of the reciprocal lattice in the Ewald plane. Closed circles show reciprocal lattice sites located parallel to the 00l axis, open circles correspond to the 01l and l sites detected in the Ewald sphere cross section, I.T. is the axis of the initial tilt of the film relative to the plane of the crystal holder, and θ is the angle between the film and crystal holder planes.*

For some reason, the TSCF does not lie on the plane of the crystal holder (CH), and we are unable to correct it. In such cases, after tilting the CH and rotating around an axis perpendicular to the CH plane, in the obtained electron diffraction pattern, some reflections are mixed from the line of ellipses. We give diagrams explaining such rotation and pointing (helping) to easy processing of the obtained electron diffraction patterns (Fig.1b,c).

Biography

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Degree : Doctor in Physical Science, Professor
Definition: 2017, November
Dissertations: Creation of new electron-diffraction and diagnostic methods, their application to the study of structures of multi-component layered semiconductors
Scientific papers: 108

Theory of heat transfer in solids

Yu. Kirsanov

Institute of Power Engineering and Advanced Technologies of FRC Kazan Scientific Center of RAS, Russia

A critical analysis of modern theories of heat transfer in a solid is given based on previously obtained data on the anisotropy of the thermal conductivity coefficient of a neodymium magnet. The agreement of the electron-photon heat transfer model with experimental data is shown. The results of additional studies of the thermal conductivity of a neodymium magnet with different orientations of magnetic field lines relative to the direction of heat flow and several values of magnetic induction, confirming the electron-photon model of heat transfer, are presented. Assumptions have been made about the influence of internal energy carriers - free electrons and photons emitted by orbital electrons of atoms in the nodes of the crystal lattice of a body - on the phenomena of thermal relaxation and thermal damping in the process of heat transfer.

Biography

Tatarstan, USSR. In 1954-1958, a student in the ship mechanics department of the Zelenodolsk Shipcraft College. 1959 - assistant ship mechanic. In 1959-1963 he was a serviceman. In 1963-1969, a student at the Kazan Aircraft Institute (KAI). 1969-1970 - engineer at KAI. 1070-1973 - postgraduate student of the Department of Theoretical Foundations of Heat Engineering at KAI. 1974-1986 - senior lecturer, associate professor of the Department of Physics, Kirov Polytechnic Institute, Kirov. 1986-1990 - senior researcher, head of the department of the Kazan Compressor Plant, Kazan. 1990-2005 - Associate Professor at Kazan State Energy University (KSEU), Kazan, Russia. 2007-2017 - professor at KSEU, Kazan. From 2005 to the present, he was a leading researcher at the Institute of Power Engineering and Advanced Technologies of FRC Kazan Scientific Canter of RAS, Kazan, Russia

Liquid crystal photoalignment and photopatterning by azodye nanolayers

Vladimir G. Chigrinov

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Nanjing Jingcui Optical Technology Co., LTD, China

Photoalignment and photopatterning has been proposed and studied for a long time [1]. Light is responsible for the delivery of energy as well as phase and polarization information to materials systems. It was shown that photoalignment liquid crystals by azodye nanolayers could provide high quality alignment of molecules in a liquid crystal (LC) cell. Over the past years, a lot of improvements and variations of the photoalignment and photopatterning technology has been made for photonics applications. In particular, the application of this technology to active optical elements in optical signal processing and communications is currently a hot topic in photonics research [2]. Sensors of external electric field, pressure and water and air velocity based on liquid crystal photonics devices can be very helpful for the indicators of the climate change.

We will demonstrate a physical model of photoalignment and photopatterning based on rotational diffusion in solid azodye nanolayers. We will also highlight the new applications of photoalignment and photopatterning in display and photonics such as: (i) fast high resolution LC display devices, such as field sequential color ferroelectric LCD; (ii) LC sensors; (iii) LC lenses; (iv) LC E-paper devices, including electrically and optically rewritable LC E-paper; (v) photo induced semiconductor quantum rods alignment for new LC display applications; (vi)100% polarizers based on photoalignment; (vii) LC smart windows based on photopatterned diffraction structures; (vii) LC antenna elements with a voltage controllable frequency.

Biography

Professor Vladimir G. Chigrinov is Professor of Hong Kong University of Science and Technology since 1999. He is an Expert in Flat Panel Technology in Russia, recognized by the World Technology Evaluation Centre, 1994, and SID Fellow since 2008. He is an author of 6 books, 31 reviews and book chapters, about 317 journal papers, more than 668 Conference presentations, and 121 patents and patent applications including 36 US patents in the field of liquid crystals since 1974. He got Excellent Research Award of HKUST School of Engineering in 2012. He obtained Gold Medal and The Best Award in the Invention & Innovation Awards 2014 held at the Malaysia Technology Expo (MTE) 2014, which was hosted in Kuala Lumpur, Malaysia, on 20-22 Feb 2014. He is a Member of EU Academy of Sciences (EUAS) since July 2017. He got A Slottow Owaki Prize of SID in 2018 http://www.ee.ust.hk/ece.php/enews/detail/660. He is 2019 Distinguished Fellow of IETI (International Engineering and Technology Institute). http://www.ieti.net/news/detail.aspx?id=184 http://www.ieti.net/memberships/Fellows.aspx

Since 2018 he works as Professor in the School of Physics and Optoelectronics Engineering in Foshan University, Foshan, China. 2020-2024 Vice President of Fellow of Institute of Data Science and Artificial Intelligence (IDSAI) Since 2021 distinguished Fellow of Institute of Data Science and Artificial Intelligence.

Physical grounds for tailoring subwavelength electromagnetic patterns with the help of nanoparticles

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Resonant light scattering by nanoparticles provides a unique opportunity to concentrate a high-amplitude electromagnetic field in a subwavelength area of space as well as to tailor and control its pattern. In addition to purely academic interest, this is extremely important for numerous applications ranging from medicine and biology to telecommunication and data processing. Despite more than a hundred years of extensive study, the problem is still far from completion. In this contribution, the author presents a review of his results in this field. In many cases, despite the smallness of the scattering particles, their light scattering has very little in common with the conventional Rayleigh case. New, counterintuitive effects, especially those related to the violation of the quasi-static description of the scattering occurring at the action of (ultra)short laser pulses, are pointed out and inspected, discussed, and classified.

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Biography

Prof. Tribelsky received his MS from Lomonosov Moscow State University in 1973, a PhD from Moscow Institute of Physics and Technology in 1976, and a Dr. of Sci. (habilitation) from Landau Institute in 1985. He received numerous national and international awards: Leninsky Komsomol Prize (1979); COE Professorship, the University of Tokyo (2006, 2008) and Kyushu University (2007), Japan; Honorary PhD, Yamaguchi University, Japan (2016), etc. Now he heads a laboratory at Lomonosov Moscow State University. His field is theoretical and mathematical physics. Presently, his interest lies in subwavelength optics. He authorizes several books, book chapters, review articles, and more than 100 research papers. See https://polly.phys.msu.ru/en/labs/Tribelsky/ for more details.

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Controlled impact with criterion of quality of the generated microcavity

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[3]*SAUNO Ltd., Russia*

The task is set to theoretically and experimentally study the mechanics of one of the subclasses of impact-controlled shape-forming microimpact (ICSFM), the characteristics of which are assessed by the integral criterion of the quality of each microcavity formed as a result of the impact, as well as the entire ordered set of cavities as a whole that make up the image. A special feature of this problem is its essentially set-theoretic nature. The reflective elementary microcavity, which is the final result of ICSFM, is called a brightness or Br-element in [1]. The universal parameter v as a subset index determines the impact force.

A controlled shaping impact is an impact with a pointed solid body (the tip of a special impact tool) on a stationary half-space such that $E_{tip} > E_{hs}$, where E_{tip} and E_{hs} are the Young's moduli of the tip and half-space, respectively. The critical stress of the tip material $\sigma_{cr.tip} > \sigma_{cr\,hs}$ is greater than the stress of brittle fracture of the processed half-space. The pointed tip of the high-frequency electromechanical vibration generator (vg), in a particular case, can have a segment-like shape with a sphere radius r tip of the order of several tens of micrometers.

According to the principle of hierarchical self-organization in nature and technology, the behavior of a solid body in force fields, including those initiated as a result of a mechanical impact, with the specified instrument parameters, can be determined in the range of average singularity [2].

The properties of the Br-element are determined by the following set of indicators J_{vg}:

– Volume V_{vg} of the internal cavity or m_{vg} – mass of the substance of the half-space in this volume;

– Radius of the spherical segment r_{vg} and depth hvg of its position relative to the surface of the half-space (or picture plane of the image);

– The roughness of the inner surface of the Br-element, which, under other conditions, determines the light-reflective and light-absorbing properties of the element;

– Geometric tolerances for the values of *r*vg and hvg;

– Contrast of the surface of the element relative to the “color” of the picture plane;

– “Smoothness” of the *Br-element* contour in the picture plane, etc.

Within the framework of the problem posed, three problems were solved.

Firstly, the task associated with determining the minimum number ν=16 subsets of *Br-elements* that make up the number of shades of gray of such a synthesized image, in which, at the expert level, a good similarity of the generated image with the original is observed. Secondly, on this basis, a universal multidimensional image quality standard has been developed in the gradation optical wedge (GOW) format, which, for one of the engraving standards, is described in [1]. Thirdly, for each *Br-element*, a control has been synthesized in the form of a modulus of the initial micro-impact velocity at the point of formation based on the principle of energy balance during destruction.

The GOW includes nominal values of the quality vector, in relation to which a quality criterion for a specific *Br-element* or a synthesized image as a whole can be constructed.

The applied significance of ICSFM lies in the use of this theory in problems of controlled impact and laser engraving.

The synthesis of controls for the formation of each *Br-element* is based on the energy criterion for the destruction of matter at the point of microimpact. This kind of example of impact engraving for a segment-shaped electromechanical vibration generator is considered in [3].

Biography

Magomed Khabibovich Magomedov, Lomonosov Moscow Stet University, Faculty of Mechanics and Mathematics, Department of Mechanics, Department of Applied Mechanics and Control, Laboratory for Mathematical Support of Simulated Dynamical Systems, Senior Researcher, since January 10, 2019.

Doctor of Physical and Mathematical Sciences since 2003.

Istina Resercher ID: (IRID): 247553557 (Intelligent System for Thematic Research of Scientometric Data).

VIRTUAL EVENT

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On the construction of a set of fundamental physical constants of unit and zero dimensions

V. Ovchinnikov[1,2]

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[2]Ural Federal University named after the first President of Russia B. N. Yeltsin, Russia

A method for obtaining an exhaustive set of multiplicative equations of relationship between the elements of an arbitrary set of the tested physical constants Cj in the form of their products in integer powers mj ranging from −N to N is proposed and used (calculations were performed for N = 2 and 4). A formal application of the proposed procedure reveals the minimum quanta of charge, mass, time, and distance and also a number of the relations describing the most general physical laws. It is shown that it is possible to construct a system of fundamental physical constants l_e, t_e, e_e, m_e, α, and β (α is the fine-structure constant) with the simplest (m, s, kg, C) and zero dimensions to describe electromagnetic and gravitational interactions, as well as with the addition of Boltzmann's constant (k), to describe the laws of thermal radiation. Planck's constant (h), the speed of light in vacuum (c), electric (ε0), magnetic (μ0) and gravitational (G) constants are expressed through the revealed minimum quanta of length, time, charge, mass, and dimensionless constants.

Biography

Vladimir Ovchinnikov specialist in the physics of metals and alloys and the Physics of Ion-Beam Exposures. Doctor of Science (Phys-Math), Professor of the Ural Federal Technical University named after the First President of Russia B.N. Yeltsin (Yekaterinburg, Russia). Chief Researcher and Head of the Laboratory Ion Beam Exposures of the Electrophysics Institute of the Ural Branch of the Russian Academy of Sciences (Yekaterinburg, Russia). Member of scientific board of the Russian Academy of Sciences 'Radiation Physics of Solids' (since 1994).

Bone allograft materials for implants additive manufacturing

I. Akhatov, A. Bilyalov, S. Chugunov, O. Shangina, S. Pyatnitskaya and **V. Pavlov**

Bashkir State Medical University, Russia

Replacement of large bone tissue defects is an urgent problem for reconstructive surgery and the consequences of injuries, diseases, and tumors. Both natural and synthetic materials can be used for implant manufacturing. Autografts and allografts have the greatest affinity for bone tissue. Optimal for regeneration are bone grafts that maximally follow the shape of the bone and fit tightly to the boundaries of the defect. In this regard, the use of high-precision additive technology for the manufacture of implants from bone allograft may be very promising.

We have worked through various scenarios for processing the material using calcination and grinding and obtaining powder of various fractions to select optimal manufacturing modes. As a result of cellular studies, it was found that crushed alloplant powder of a low fraction exhibits insufficient biocompatibility (below 50% compared to the negative control), which is explained by the complexity of the interaction of MG63 cells with small micro- and nanoparticles. Cells are not able to attach to such particles, and powder nanoparticles block metabolic processes on the cell membrane, which is reflected in the relative cytotoxicity of the powder material. At the same time, the situation changes radically when cells interact with alloplant material, additively converted into a solid object, and sintered at high temperature.

Presented results may serve as a basis for the development of technological platform for production of allograft-based implants.

Biography

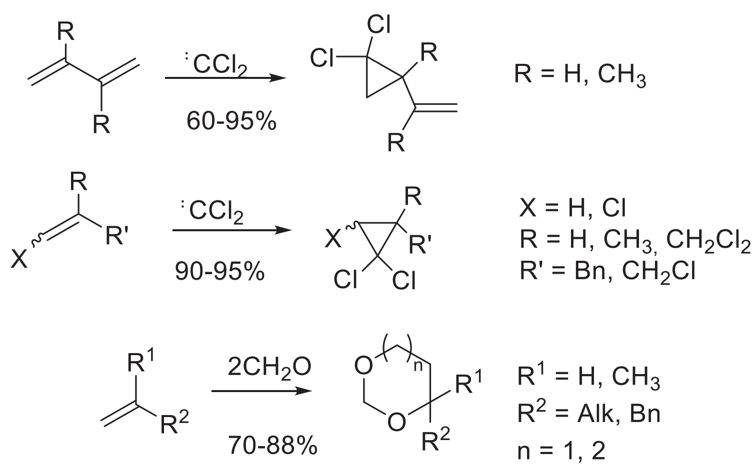
Iskander Akhatov got B.S. and M.S. in Physics from Lomonosov Moscow State University (1974-1979); Ph.D. in Mechanics of Liquids, Gases, and Plasma in 1983; Doctor of Physical and Mathematical Sciences in 1990. He served as a University Professor, Department Chair, Director of Institute of Mechanics of Russian Academy of Sciences in Ufa (Russia), was a visiting researcher at the University of Gottingen (Germany, 1993-2000), Boston University (USA, 1999), Rensselaer Polytechnic Institute (USA, 2001-2003), and Tenured Full Professor at North Dakota State University (USA, 2003-2015). After that he was a Professor and Director of the Center for Materials Technologies at Skolkovo Institute of Science & Technology, Moscow, Russia (2015-2022). Currently, he is affiliated with Bashkir State Medical University in Ufa, Russia. His research focus is on micro-and nanometer-scale mechanics, as well as dynamics and acoustics of bubbles and multiphase systems with applications to materials, advanced manufacturing, and bioengineering.

Gem-Dichlorocyclopropanes and 1,3-Dioxacyclanes: Synthesis based on petroleum products and use in low-tonnage chemistry

S. Zlotsky, R. Sultanova and **G. Raskil'dina**

Ufa State Petroleum Technological University, Russia

Modern low-tonnage chemistry and fine organic synthesis are based on a limited number of key compounds, for which the raw materials are cheap and affordable petrochemical products. The basic platform compounds include the transformation products of olefins and dienes, that is, substituted gem-dichlorocyclopropanes and 1,3-dioxacyclanes. These compounds are easily formed in quantitative yield as a result of the addition of dichlorocarbene to carbon–carbon double bonds by the Makoshi method and the condensation of olefins with aldehydes (Prince reaction) in the presence of acid catalysts.



Separate reactions of O-, N-, C-alkylation of these compounds leading to the formation of heterocycles containing gem-dichlorocyclopropane and 1,3-dioxolane fragments are presented. Data are provided on radical polymerization, copolymerization, lowtemperature ozonolysis, catalytic isomerization of vinyl-gem-dichlorocyclopropanes, as well as the study of reactions of 2,2-dimethyl-1,3-dioxolane with diazoacetoacetic ester. The possibilities of using the synthesized substances as biologically active compounds, as well as preparations capable of inhibiting the acid corrosion of metals, are shown.

Biography

Semen Zlotsky is a Soviet and Russian chemical technologist. Doctor of Chemical Sciences (1977), Professor (1981). Honored Inventor of the Bashkortostan Autonomous Soviet Socialist Republic (1989), Honored Scientist of the Republic of Bashkortostan (2009), Corresponding Member of the Academy of Sciences of the Republic of Bashkortostan (2009).

His scientific field is the homolytic transformations of 1,3-diheterocycloalkanes this made it possible to create general methods for obtaining different types of alkanes, esters of glycols, haloidhydrins and other polyfunctional, as well as the structure and activity of dialkoxyalkyl radicals. Under his leadership, work was carried out on the synthesis of polyfunctional saturated heterocyclic compounds and their prospects as solvents, plasticizers, corrosion inhibitors, stabilizers and additives to polymers, biologically active preparations have been created, reagents of the cyclic acetal class for organic synthesis and biomedical research have been created.

A universal procedure for adjusting thunderstorm data in numerical models of atmospheric dynamics

K.G. Rubinstein and **M.M. Kurbatova**

Nuclear Safety Institute of the Russian Academy of Science, Russia

Thunderstorms are dangerous meteorological phenomena of high intensity. As a rule, thunderstorms include a series of intense electrical discharges that can be well recorded, even at long distances of several thousand kilometers. In this regard, the number of special lightning direction finding observation networks has been growing intensively in the world in recent years. The possibility of lightning detection makes it possible to objectively investigate the electrical nature of thunderstorms or convection and arouse interest in including lightning location data in numerical models of atmospheric dynamics to improve the prediction of adverse weather conditions accompanying thunderstorms (for example, heavy precipitation, hail and wind gusts). The occurrence of lightning flashes is physically related to some atmospheric parameters caused by intense convection. Several schemes of assimilation of thunderstorm data in numerical models of atmospheric dynamics were proposed, a brief overview of which is given in the report. The authors use the relationship between the mechanisms of thunderstorm formation with characteristic vertical profiles of humidity and temperature, the presence of hydrometeors, latent heat, and the main triggers for convection schemes. In our work, we took advantage of the property of thunderstorms that they are always provoked by intense convection, and we propose a procedure where, according to the data of the thunderstorm direction finding networks used, the cells of the calculated grid in which the thunderstorm was observed are determined. Then moisture is added iteratively to these nodes, until thermodynamic instability occurs. This is the main idea of the procedure. The procedure is described in more detail and we show results of using it in WRF-ARW model. All estimations of forecast errors in area of thunderstorm became much less, spatially for precipitation.

Biography

Rubinstein Konstantin Grigorjevich

- Head of laboratory of Atmospheric process modeling in Nuclear Safety Institute of the Russian Academy of Science Dr. of science since 2006.
- Work in area of numerical whether prediction from 1970 year.
- Have more than 100 publications in different journals and many Phd students.

Education:

- Dr. Konstantin G. Rubinstein was educated in Moscow Institute of Electronic Engineering Graduated cum laude in Radio and Electronics as Applied Mathematics.
- Then, he joined the Hydrometeorological Institute of USSR as a system Programmer.
- Than, 1972-1976 - Post-graduate course at Hydrometcentre of USSR and 1977 Ph.D in Physics and Mathematics Thesis with title "Numerical Modeling of Atmospheric Circulation in Tropics"
- 2006 – Doctor of Science with thesis "Modeling of General Circulation of Atmosphere for investigation of Climate Change and Pollution Transport"
- Major fields of interest are the general circulation of atmosphere and global climate change modeling by 3, 2 and 1 dimension models, new parameterization of physics processes in atmosphere and supplying of meteorological data models of transboundary transport of pollution, last years short range forecast by regional models WRF-ARW and connected with transport models.

Content and distribution of Ag, Au, Bi, Cu, and Mo in surface soils. Case study: Mitrovica region, Republic of Kosovo

Milihate Aliu[1], **Robert Šajn**[2] and **Trajče Stafilov**[3]

[1]*Department of Industrial Engineering, Faculty of Engineering and Informatics, University of Applied Sciences in Ferizaj,*
[2]*Geological Survey of Slovenia, Slovenia*
[3]*Institute of Chemistry, Faculty of Natural Sciences and mathematics, Ss Cyril and Methodius University,Republic of North Macedonia*

So far, neither the distribution of any of the anthropogenic associations of the potentially toxic elements (PTEs) such as Ag, Bi, Cu, Mo and Au in the soils of the Mitrovica region, Republic of Kosovo, nor their influencing factors or the risks they pose have been studied in detail. Therefore, it is important to monitor the content of these PTEs in order to obtain more information for ecological risk assessments. For these reasons, the objectives of this study were to: (1) investigate the spatial distribution of Ag, Au, Bi, Cu and Mo in the surface soils of the Mitrovica region, Republic of Kosovo, (2) identify their possible sources in the soils of the study area, and (3) evaluate the degree of possible enrichment of the soils with the mentioned PTEs using different pollution indices that can be evaluated comparatively. For this study, 156 surface soil samples (0 cm to 5 cm depth) were collected in an area of 301.5 km2 according to the regular sampling grid of 1.4 km ×1.4 km. The content of elements was determined by inductively coupled plasma-mass spectrometry after aqua regia digestion according to 1DX1 method. Universal kriging with a linear variogram interpolation method was applied to construct maps of the spatial distribution of particular elements and factor values in topsoil. The data for all the metals studied follow the lognormal distribution. The values of the metal content vary considerably from element to element and from the location of the collected samples. Copper is the most abundant trace metal in the soil of the study area, followed by Bi and Ag, and Mo and Au. The results showed that the average content of Cu (42 mg/kg), Bi (1.5 mg/kg), Ag (0.44 mg/kg), and Au (2.7 μg/kg) exceeded their average content in European and world soils by 3.4 and 1.4 times; 3.0 and 7.5 times; 1.62 and 8.8 times and 2.7 and 1.8 times, respectively. The average Mo content (0.68 mg/kg) exceeded the average content in European soils by 1.09 times, while the average content in world soil was not exceeded.

Table 1. Enrichment factor and geo-accumulation index of Ag, Au, Bi, Cu and Mo in the soils of the study area. European and world values are used for comparison (values for Au are given in µg/kg, for the other metals in mg/kg).

	EU [1]	World [2]	Study area	Zone (I)	Zone (II)	Zone (III)	Zvecan	Mitrovica	Vushtrri
n	843	-	156	30	65	61	5	11	8
Ag	0.27	0.05	0.44	3.5	0.52	0.13	29	2.1	0.26
Au	1.0[40]	1.5[41]	2.7	9.6	2.6	1.6	61	8.6	5.0
Bi	0.50	0.2	1.5	7.3	1.7	0.61	51	4.5	0.89
Cu	12	30	42	100	41	28	510	80	34
Mo	0.62	1.2	0.68	0.96	0.86	0.46	1.8	0.92	0.56
$EF_{EU\text{-}Ag}$	-	-	7.9	63.4	9.42	2.35	528	38.0	4.69
$EF_{World\text{-}Ag}$	-	-	52.3	417	61.8	15.4	3,443	250	30.8
$EF_{EU\text{-}Au}$	-	-	13.2	47.0	12.4	7.6	299	41.8	24.1
$EF_{World\text{-}Au}$	-	-	10.5	38.0	10.0	6.2	238	33.8	19.5
$EF_{EU\text{-}Bi}$	-	-	14.5	70.7	16.5	5.90	494	43.6	8.61
$EF_{World\text{-}Bi}$	-	-	44.6	217	50.6	18.1	1,518	134	26.5
$EF_{EU\text{-}Cu}$	-	-	16.9	40.3	16.5	2.3	205	32.2	13.7
$EF_{World\text{-}Cu}$	-	-	8.3	19.7	8.0	1.1	101	15.8	6.7
$EF_{EU\text{-}Mo}$	-	-	5.33	7.54	6.76	3.61	14.1	7.22	4.39
$EF_{World\text{-}Mo}$	-	-	3.34	4.73	4.20	2.26	8.87	4.53	2.75
$I_{geo}EU\text{-}Ag$	-	-	0.11	3.11	0.36	-1.63	6.16	2.37	0.63
$I_{geo}World\text{-}Ag$	-	-	2.55	5.54	2.79	0.79	8.59	4.80	1.79
$I_{geo}EU\text{-}Au$	-	-	0.84	2.67	0.79	0.09	5.34	2.51	1.73
$I_{geo}World\text{-}Au$	-	-	0.26	2.09	0.20	-0.49	4.76	1.93	1.15
$I_{geo}EU\text{-}Bi$	-	-	1.0	3.28	1.18	-0.29	6.08	2.58	0.24
$I_{geo}World\text{-}Bi$	-	-	2.32	4.6	2.5	1.02	7.4	3.9	1.56
$I_{geo}EU\text{-}Cu$	-	-	1.22	2.47	1.18	0.63	4.82	2.15	0.91
$I_{geo}World\text{-}Cu$	-	-	-7.81	1.15	-0.13	-0.68	3.5	0.83	-0.40
$I_{geo}EU\text{-}Mo$	-	-	-0.45	0.04	-0.11	-1.01	0.95	-0.01	-.0.73
$I_{geo}World\text{-}Mo$	-	-	-1.40	-0.90	-1.06	-1.96	-	-0.96	-1.68

n - number of samples; EU – European average value; World - average value in world soils

From the enrichment factors (EF) and the geo-accumulation index (I-geo), as well as from the distribution maps of metal contents, it is evident that the soils of the entire study area are heavily contaminated with copper and bismuth, with extremely high enrichment of Cu, Bi and Ag in the soils of zone I and the urban soils of the cities of Zveçan and Mitrovica. The factor scores of the association of the studied elements (Ag, Cu, Bi, Mo and Au) are highest in the soils collected in the area of the cities of Zveçan and Mitrovica. The lowest contents are found in the south of the study area (point B) near the town of Vushtrri. Furthermore, Copper levels exceeded the Dutch target value of 36 mg/kg in 152 km2 and the Dutch action value of 190 mg/kg in 6.2 km2 of the study area. Therefore, the establishment of a monitoring and treatment program for contaminated soils in this zone would be necessary to protect human health.

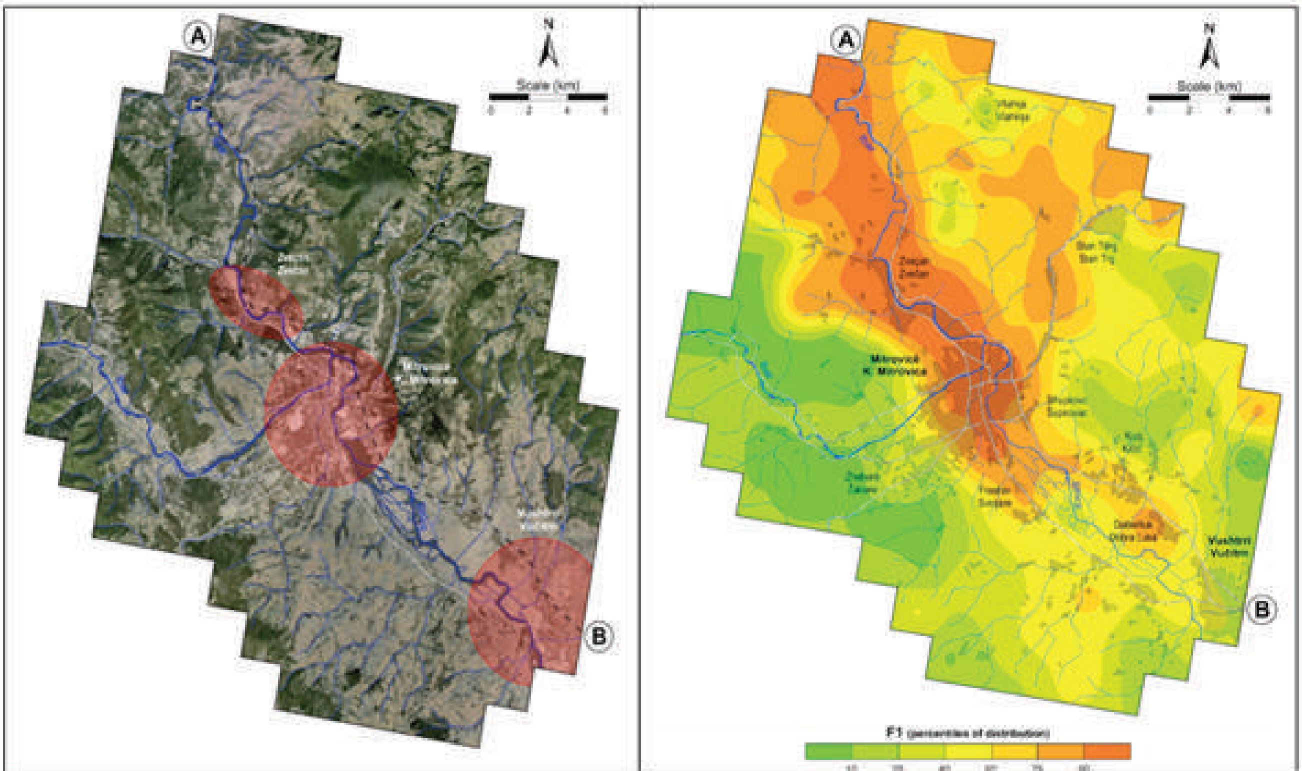


Figure 1. Main urban areas in the study area (Mitrovica region, Republic of Kosovo)

Figure 2. Spatial distribution of Ag, Au, Bi, Cu and Mo in the surface soils of the Mitrovica region, Republic of Kosovo

Biography

Milihate Aliu has received her B.Sc. (1990) and M.Sc. (2004) in University of Prishtina, Faculty of Mathematical-Natural Science, Department of Chemistry, Republic of Kosovo. PhD (2011) has received in SS. Cyril and Methodius University, Faculty of Natural Sciences and Mathematics, Institute of Chemistry, Skopje, Republic of North Macedonia. From 2001-2007 she was with the Faculty of Science, Prishtina, Republic of Kosovo as teaching assistant, from 2002-2004 was as teaching assistant at State University of Tetovo, Republic of Macedonia and from 2004-2011 she was with Faculty of Medicine, Prishtina, Republic of Kosovo as teaching assistant. In 2012 she was elected Assistant Professor at University of Prishtina, Faculty of Applied Sciences. From 2017 to now she is with University of Applied Sciences in Ferizaj, Republic of Kosovo as Associate Professor. She is author of 3 books, 7 chapters, 15 papers and 42 presentations. Her research interest is in analytical and environmental chemistry.

Ceramics in our lives and cultural connections with the world – View from the ancient trading port of Van Don (Vietnam)

Le Thi Lien

Vietnam Association of Archaeology, Vietnam

Ceramics are the first artificial materials created several thousands of years ago by humans in their evolutionary history, starting with low temperature fired earthenware. Along with the development of human society, the development of both technology and art has made ceramics increasingly diverse and play many different functions in daily life of the people. They have been also evidences of cultural, economic and technical l exchanges between societies and civilizations. This presentation introduces the results of archaeological research in the ancient trading port area of Van Don (Vietnam), where ceramics demonstrate some of their value in the daily life as well as in the cultural relationship of the Vietnamese people with the outside world. The content includes the following sections:

Introduction: Geographic location and natural resources of the islands belonging to the ancient trading port of Van Don

The presence of people in Van Don: evidence from Prehistoric times Van Don was formally established as Dai Viet (modern Vietnam) international seaport in the 12th century

Ceramics - The richest material evidence discovered in Van Don

- Types of ceramics discovered from Van Don: from Vietnam, China and possibly other regions
- Their story about where do they come from, where are they produced; what are they for and where were they taken, etc.
- What stories can they tell us about Vietnamese and world history?

The present and future of ceramics

While the world is developing more and more new materials, can ceramics still retain their role? My thinking about the future of ceramics through observations from Van Don and from Vietnam.

Biography

Le Thi Lien started her career in 1985 as researcher of the Institute of Archaeology (VASS) until her retirement in 2017. She is now Executive Member of Association of Archaeology (Vietnam), Member of International Committee on the Underwater Cultural Heritage (ICUCH).

Her main research interests include: archaeology of art and religion (Buddhism and Hinduism), Oc Eo culture and maritime archaeology. She also participates in many activities related to research, protection, preservation and promotion of cultural heritage in Vietnam.

With experiences on archaeological research and UNESCO's activities, she leaded several international research programs, joined in organizing trainings in cultural heritage protection and underwater archaeology (NAS training course), and worked as member of Organizing Boards for several International Conferences on archaeology. She is also advisor and joined in the preparation of several dossiers of the world heritages in Vietnam.

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Sourcing third party logistics service providers based on environmental, social and corporate governance: A Case Study

Otacilio José Moreira[1] and **Maria Carolina Martins Rodrigues**[2]

[1]*Universidade Federal Fluminense, Brazil*
[2]*Universidade do Algarve, Portugal*

The acronym ESG, environmental, social and governance, emerges as a strong trend in the era of the circular economy and stands out as a need for companies to respond to the segment in which they operate. Although most studies have been done in the past, they did not address ESG criteria to ensure operator exemption for logistics providers. Further research on the application of realistic circular economy techniques is recommended. Therefore, strategic sourcing, based on multicriteria decision analysis (MDA), considering parameters such as economic, technical, and environmental factors, has created a perfect methodology that considers all these essential requirements, revealing an excellent way to outsource logistics service providers (LSPs). The article aims to prove MDA's effectiveness awarding the best LSP through predefined dimensions involving human resources, risk management, environmental and other social aspects, indicating dedication and commitment to social environmental issues and corporate governance during a procurement's strategic sourcing in a Brazilian pharmaceutical company process. A Literature review supported by a real case study where a multifunctional team from Pharmaceutical and Consultants proved the objective was valid. A secondary objective was demonstrated on how current sustainability challenges can be overcome by the organization and generate value for its stakeholders and society, showing responsibility and commitment to environmental, social, and corporate governance issues. After reviewing all the concepts involved using the literature review, the results were achieved indicating that sourcing process' case study through MDA validated the effectiveness choosing the 3PL with the best results in ESG. The article deals with a current, relevant, and not very explored topic and may contribute to enhancing the investments of logistics service providers (LSPs) in ESG, mainly those that weren't awarded at end of the project.

Which form of environmental enrichment is most effective in rodent models of Autism?

Cassia Regina Suzuki Caires Flores[1] and **Ana Luiza Bossolani-Martins**[2]

[1]*São José do Rio Preto, Brazil*
[2]*Federal University of Mato Grosso do Sul - UFMS, Brazil*

Environmental enrichment (EE) is known to produce experience-dependent changes in the brains and behaviors of rodents, and it has therefore been widely used to study neurodevelopmental disorders, including autism. Current studies show significant protocol variation, such as the presence of running wheels, number of cagemates, duration of enrichment, and the age of the animals at the beginning and end of the enrichment interventions. EE has been shown to have prominent positive effects in animal models of idiopathic and syndromic autism, but little is known about the ideal type of EE and the most efficient protocols for reversing autism spectrum disorder (ASD) behaviors modeled in rodents. This review presents evidence that social enrichment is the most effective way to rescue typical behaviors, and that variables such as onset, duration, and type of induction in the ASD model are important for EE success. Understanding which EE protocols are most beneficial for reversing ASD behaviors modeled in rodents opens up possibilities for the potential treatment of neuropsychiatric disorders characterized by behavioral deficits, such as autism.

Biography

Pharmaceutical from Centro Universitário de Rio Preto (UNIRP - 2011). Master in Genetics (IBILCE/UNESP), with an emphasis on molecular and cellular biology (2016), with a dissertation entitled "Effects of exposure to chrisin during the lactation period on the ventral prostate of adult gerbiles (Meriones Unguiculatus)," she was part of the group of Reproductive Biology at the Microscopy and Microanalysis laboratory at the Institute of Biosciences, Letters and Exact Sciences from 2012 to 2016. PhD in Health Sciences (2023 - FAMERP), with thesis entitled "Effect of hypericum perforatum extract on an animal model of autism induced by prenatal exposure to valproic acid" and, since 2017, has been part of the research team at the Laboratory of Experimental Physiology at the Faculty of Medicine of São José do Rio Preto (FAMERP).

Outcomes of impaction bone grafting in the management of acetabular defects with the use of uncemented acetabular cups: Do autografts and irradiated femoral head allografts integrate?

Suresh Chopra[1], **Hak Lian Teh**[1], **Veenesh Selvaratnam**[1,2], **Wei Jian Low**[1,2], **Ahmad Fauzey Kassim**[1] and **Shubash Shander Ganapathy**[3]

[1]*Hospital Sultanah Bahiyah, Malaysia*
[2]*Department of Orthopedic Surgery, Universiti Malaya, Malaysia*
[3]*Institute for Public Health, National Institute of Health, Ministry of Health Malaysia, Malaysia*

Introduction: Acetabular impaction bone grafting (AIBG) has been used to reconstruct acetabular defects in complex primary and revision cases. The method employs using fresh frozen bone graft and a cemented acetabular cup. The aim of this study was to look at the outcomes of AIBG using either frozen irradiated femoral head allografts or autografts with uncemented acetabular cups.

Method: We retrospectively reviewed 38 patients who had AIBG and uncemented cup reconstruction of the acetabulum performed between 2008 and 2021 for complex primary and revision surgery. Graft incorporation, radiological loosening and cup migration were evaluated in follow-up X-rays.

Results: There were 24 complex primary and 14 revision total hip arthroplasty cases. Autografts were used in 10 hips with smaller defects, while 28 hips with larger defects required frozen irradiated femoral head allografts. Using the Paprosky classification to evaluate acetabular defects, 8 patients were classified as 2A, 12 as 2B, 7 as 2C, 8 as 3A and 3 as 3B. The Kaplan–Meier survival rate for AIBG with uncemented cups in our series is 89.70% at 10 years. Acetabular cup position was anatomically restored in all autograft AIBG cases and in 25 out of 28 in the allograft group. The mean pre-operative Oxford Hip Score (OHS) was 19 (range 10–24) and post-operative OHS was 39 (range 21–48) ($p<0.001$).

Conclusions: The mid-to long-term result for AIBG using irradiated bone or allograft and uncemented acetabular cups is good. With newer and more porous uncemented cups, especially revision cups, it may serve as an extended indication to achieve solid fixation in managing acetabular defects of ≤ 3A.

Biography

Present Post

1. Consultant Orthopaedic and Arthroplasty Surgeon, Putra Medical Centre, Alor Setar, Kedah, Malaysia.

Previous Posts

1. Senior Consultant and Head, Department of Orthopaedics and Traumatology, Hospital Sultanah Bahiyah (HSB), Alor Star, Kedah for 26 years
2. Head of Arthroplasty Unit, HSB, Hospital Alor Star
3. Arthroplasty Subspecialty Chairman, Ministry of Health, Malaysia for 14 years
4. Member of Combined Board of Orthopaedic Examiner (CBOS) for the final year examination of Masters in Orthopaedic Surgery Examination.
5. Honorary lecturer and trainer for Orthopaedics Masters (Post-graduate) Course of Universiti Malaya Medical Centre (UMMC), Universiti Kebangsaan Malaysia (UKM), Universiti Sains Malaysia (USM), International Islamic University Malaysia (UIA).
6. Honorary lecturer for Undergraduate Medical Course of Asian Institute of Medical Sciences and Technology (AIMST) College and Insaniyah College University.

Effect of ultraviolet photofunctionalization on the antimicrobial properties in short implants; Clinical parameters and levels cytokines markers IL-1β and TNF-α

Naira Ghambaryan and **Gagik Hakobyan**

Yerevan State Medical University, Armenia

Objective: To evaluate the effect of ultraviolet photo functionalization on the antimicrobial properties in short implants.

Materials and Methods: The study included 89 patients (aged 25 to 64 years, 43 women and 46 men), without any systemic diseases, with unilateral/bilateral missing teeth and of the vertical atrophy posterior segments of jaw bones. The patients underwent a thorough clinical examination according to the generally accepted scheme, the qualitative and quantitative parameters of the jaw bones of the patients were diagnosed using cone beam computed tomography (CBCT). Implant surgery was performed, according to the manufacturer's guidelines. The random distribution of patients into 2 groups; 1group included 62 patients with UV-photofunctionalized 157 short implants (5-6 mm), 2 group included 37 patients with non UV- photofunctionalized 108 short implants(5-6 mm). The clinical parameters of the dental implant sites were evaluated by assessing probing depth (PD), the bleeding on probing index (BOP), marginal bone level (MBL).

Concentrations of interleukin IL-1β and tumor necrosis factor-alpha (TNF-α), cytokines in blood serum were evaluated using enzyme-linked immunosorbent assay. To assess the primary stability of implants ISQ (Implant Stability Quotient) using Osstell Mentor device(Osstell AB, Göteborg, Sweden). Before implant placement ultraviolet functionalization of implant surfaces was performed by UV Activator YWJ-QSY001. The clinical parameters of the dental implant sites were evaluated by assessing PD, BOP, marginal bone MBL 3 months, 1 year, 3 years, and 5 years after implant installation, compared with values at last follow-up.

Results: After implant surgery, the patients Group-A had no postoperative reactions including swelling, discoloration, discomfort, hematomas. After implant surgery, the patients Group-b had a mild postoperative reaction including swelling, discomfort.

Clinical radiological results of dental implants in patients have shown satisfactory results and are encouraging. There were no clinical examinations of serious biological or prosthetic complications, and the functional and aesthetic outcome assessed by the patients was good.

There were different correlations between clinical indexes and indicators of cytokines markers show among patient groups.

Survival rate of implants in patients Group-A 97,9% during the first year of functional loading and after five-year 97,3%.

Survival rate of implants in patients Group-B 97,3% during the first year of functional loading and a five-year survival rate of 96,2% after five-year.

The results of the study showed that implant failures occurred mainly after 1 stage surgery and during the 4-5 year of functional loading, which is associated early pery-implantitis and perimucositis and is one of the factors associated with implant failure.

Conclusion: Irradiation of titanium surfaces with UV light has shown an antimicrobial effect, may play an important role in the prevention of peri-implantitis is one of the factors associated with implant failure. Monitoring levels of the cytokines TNF-α and IL-1β may help early diagnosis of peri-implantitis and prognosis in high-risk patients. In particular, an elevated level of TNF-α may indicate the onset of an inflammatory process in the tissues around the implant without clinical symptoms.

Biography

Lecturer Dept.of Oral and Maxillofacial Surgery, Yerevan State Medical University after M. Heratsi, Yerevan, Armenia

2009-2012 Clinical residency in the department of Dental and Maxilla-Facial surgery, YSMU

2005-2006 Internship, Yerevan state medical university after M. Heraci

2000-2005 Yerevan state medical university after M. Heraci, stomatological faculty

Work experience

Since 2015 Lecturer, Department of Dental and Maxilla-Facial surgery, YSMU

2012-2015 Senior laboratory assistant, Department of Dental and Maxilla-Facial surgery, YSMU

2010-2011 Senior laboratory assistant, Department of Dental and Maxilla-Facial surgery, YSMU

2006-2009 ‵′Dense′′ dental clinic, position dental therapist

Trainings

2016-2017 Qualification handing course on topic ‵′Psychology′′, ‵′Pedagogic′′, ‵′Testing Methodology′

Novel prepared eco-friendly PO/CO nanocomposite from renewable resources for improving the anticorrosion properties of epoxy for steel surface coatings

A.M. Fadl and **M.I. Abdou**

Production Department, Egyptian Petroleum Research Institute, Egypt

Different trials are performed for utilization of renewable materials via steel protective coating applications to offer multifunctional properties. The present work investigated the preparation of novel renewable Portulaca oleracea (common purslane) extract (PO) doped with cupric oxide nanoparticles (CuO NPs) to form anticorrosion eco-friendly nanocomposite modifier (PO/CO) which dispersed through the epoxy binder. Portulaca oleracea (common purslane) extract (PO) was analyzed using GC-Mass technique and demonstrated some amino and polyol compounds that contributed in supporting the dispersion via vehicle in addition to supporting the crosslinking density. Several characterization techniques were applied to identify CuO NPs such as TEM, XRD and SEM techniques. The anti-corrosion behavior of surface modified PO/CO epoxy hybrid nanocomposite was investigated via studying the rust grade, blistering ratio and frequency in addition to adhesion parameters. The loading level of 7% by wt of nano-modifier (PO/CO) displayed the superb protective behavior in which The visual photographic results showed the absence of blisters at #8 size with few frequency, no softening observed in the cured coating layer, the best corrosion mitigation performance at rust degree of 10, and perfect cross-cut adhesion of 5B grade. The weight loss calculations recorded the corrosion rate (CR) minimum estimation at 0.0003 mm/y and the protection efficiency (PE) offered the maximum value at 99.9%.The recorded results were attributed to the increased amount of the nanocomposite modifier then, reinforcing the cross-linking density of coating layer in which consolidate the C-steel/epoxy interface adhesion.

Review on structural and electrical properties of Co- Mn -Zn ferrite and its applications

Asmaa Reda, Kasem Rady, Ezzat El-fadaly and **Mobarak Hassan**

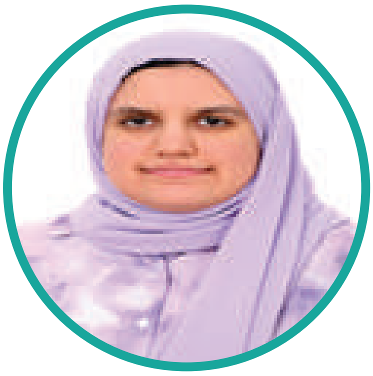
Sadat City University, Egypt

Several years of worldwide revolutionary developments in nanoscience, combining physics, chemistry, material science, theory and even biosciences, have brought us to another level of understanding. The remarkable progress in science and technology is established with the advancement in nanoscience and nanotechnology. Basically, ferrites are ceramic materials, dark grey or black in appearance and very hard and brittle. Ferrites may be defined as magnetic materials composed of oxides containing ferric ions as the main constituent. Ferrites have much less electrical conductivity compared to metallic ferro magnets, continues to be the most important magnetic materials in various high-frequency applications, having repressed eddy currents and lowered energy loss in high-frequency use. Therefore, ferrites are playing a great role in many devices of every-day life (ac and dc motors, power distribution systems, video and audio applications, microwave devices, antenna rods, loading coils, core material for power transformers in electronics, high-frequency devices, memory devices such as hard disks, floppy disks, capacitor electrode, catalysis, drug delivery, water treatment, and gas sensor.

Ultrafine Cobalt Zinc ferrite powders have been synthesized by co-precipitation method. Moreover, the effect of substituting $Mn2+$ ions on the crystal structures, microstructure, and dialectical properties of Co-Zn ferrites were studied. The effect of this dopant on the average of crystallite/grain size, lattice parameter, density, the purity of the formed phase, and morphology of the synthesized nanoparticles was determined. The prepared powders were characterized using X-ray diffraction, Fourier Transformation, Infrared Spectra, Transmission electron microscopy, and LCR Bridge. We obtained an improvement in the dielectric properties of the prepared samples, making them suitable for use in high-frequency applications due to the substitution by Mn ions.

Biography

Asmaa Reda has completed her master's degree Environmental science in Physics from Sadat city University, Egypt. She is a scientific researcher in physics and environmental science especially in nanoscience in Sadat city University, Egypt. She has publications in springer, and her publication in Q2, and serving as a reviewer member of springer Journals.



Efficacy of vibration motion in comparison to reciprocation motion in retreatment of root canals obturated with lateral compaction technique: An *in vitro* study

Yomna Adel Serageldin[1], **Abeer Abdulhakim Elgendy**[2] and **Ahmed Hussein Abuelezz**[1]

[1]*Misr International University, Egypt*
[2]*Ain Shams University, Egypt*

Background: Most root canal retreatment methods do not completely remove filling material from the root canal walls.

Aim of the study: to evaluate the effect of reciprocation motion in comparison to vibration motion in the removal of root canal filling in retreatment procedure after obturation using lateral compaction technique.

Materials and methods: Forty-eight maxillary first molars were selected. Obturation using bioceramic sealer was performed in all distobuccal canals using lateral compaction technique. Teeth were randomly divided into two main groups (n = 24) according to the technique of removal of root canal filling material: Groups A and B: reciprocation and vibration motions, respectively. The percentage of remaining filling material was evaluated using a stereomicroscope, heat on the external root surface was measured using a thermocouple, and time for filling removal was calculated using a stopwatch.

Results: Statistical analysis showed that there was no significant difference between the two groups regarding the percentage of debris in the coronal and middle thirds, and regarding the time of removal of root canal filling. There was a statistically significant difference between the two groups regarding the percentage of debris in the apical third and regarding the heat on the external root surface.

Conclusion: Vibration motion caused a lower percentage of debris in the coronal and middle thirds. Reciprocation motion was most effective in the removal of root canal filling, especially in the apical third. Vibration motion caused a higher temperature increase on the external root surface. Reciprocation motion required less time for the removal of root canal filling than vibration motion.

Biography

Yomna Serageldin is a dentist and master's student in the endodontics department at Misr International University. She received her bachelor's degree in Oral and Dental Medicine from Misr International University. Yomna has been working in the dental field for about 7 years and has experience in endodontics and restorative dentistry. She manages her private practice in Cairo, Egypt, and works on providing the utmost healthcare for her patients. She is interested in new research concepts in endodontics, especially in the field of retreatment and regeneration. She is keen on learning new techniques and recent advances in her area of specialty.

Synthesis of an oxide functional coating using plasma electrolytic oxidation in molten salts

K. Borodianskiy

Depatrment of Chemical Engineering, Ariel University, Israel

Plasma electrolytic oxidation (PEO) is a promising eco-friendly electrochemical method to create a highly adhesive oxide coating on a metallic substrate. PEO coatings usually exhibit enhanced wear and corrosion resistance, and in some cases, increased bioactivity. Traditional PEO is conducted in various aqueous electrolytes. However, recently, we have discovered an alternative approach to PEO, its processing in molten salts. This method is more effective due to the ability to treat large-area surfaces and to provide coating purity.

In this research, we show the synthesis of oxide surfaces on aluminum, titanium, and zirconium alloys by PEO treatment in nitrate salts. Additionally, the study focuses on a comprehensive study of microstructure, phase composition, corrosion resistance, and coating response to the biological environment. The advantages of the proposed method will be highlighted and compared to the traditional PEO method. Finally, a discussion on future aspects of PEO in molten salt will be presented.

Biography

Prof. Borodianskiy is a Vice Dean for R&D and a head of Metallurgy and Applied Nanoscience Research Lab at Ariel University, Israel. He earned a Ph.D. in 2011, followed by a postdoc position at the University of Windsor, Canada. His research interests combine traditional and advanced methods of synthesis and examination in metallurgy and materials science. His works focus on non-ferrous alloys, coatings synthesized by plasma electrolytic oxidation, and microstructure engineering of materials for renewable energy. He has published over 40 peer-reviewed papers and two book chapters and supervised 15 graduate students. His research work was awarded by the World Innovation Summit in the US, he received an Outstanding Teaching Award for four years. Prof. Borodianskiy is a member of many international conference organizing committees, a guest editor of numerous peer-reviewed journals, and an active reviewer of several high-quality scientific journals.

A new approach to breast cancer terminology based on the anatomic site of tumour origin: The importance of radiologic imaging biomarkers

László Tabár[1], **Peter B. Dean**[2], **F. Lee Tucker**[3], **Amy Ming-Fang Yen**[4], **Sam Li-Sheng Chen**[5], **Grace Hsiao Hsuan Jen**[5], **Jackson Wei-Chun Wang**[5], **Robert A. Smith**[6], **Stephen W. Duffy**[7] and **Tony Hsiu-Hsi Chen**[5]

[1]Falun Central Hospital, Sweden
[2]University of Turku, Finland
[3]Virginia Biomedical Laboratories, USA
[4]Taipei Medical University, Taiwan
[5]National Taiwan University, Taiwan
[6]American Cancer Society, USA
[7]Queen Mary University of London, UK

Purpose: To use mammographic tumour features (imaging biomarkers) to classify breast cancer according to its apparent anatomic site of origin in the new era where tumours are found at their nonpalpable, earliest detectable phase.

Method: Large format, subgross, three-dimensional histopathologic images of breast cancer subtypes and their corresponding imaging biomarkers were correlated with large format thin section histopathology and long-term patient outcome.

Results: This systematic correlation indicates that breast cancers arise from three separate fibroglandular tissue components: the terminal ductal lobular units (TDLUs), the major lactiferous ducts, and in the stem cells of the mesenchyme. The resulting three cancer subgroups have distinctly different clinical, histopathological and mammographic presentations and different long-term outcomes. The relative frequency of these three breast cancer subgroups is approximately 75%, 20% and 5%, respectively. Classification of breast cancers according to their anatomic site of origin, as demonstrated with breast imaging and confirmed by subgross histopathology, correlates closely with the long-term patient outcome.

Conclusions: Classification of breast cancers according to their site of origin helps overcome the inconsistencies in the current histopathologic terminology with its ductal-lobular dichotomy. The ability of the imaging biomarkers to determine the site of tumour origin and serve as a prognostic

indicator emphasizes the increasingly crucial role of breast imaging in the management of breast cancer. Basing breast cancer management upon anatomically relevant terminology challenges the conventional mindset. Our proposals are based on research results from an unprecedented number of prospectively collected nonpalpable breast cancers diagnosed at their earliest detectable phases and followed up for several decades. This article is a general introduction to a series of forthcoming articles describing in detail the breast malignancies originating from the three sites of origin.

Biography

László Tabár, MD, FACR (Hon)

Professor Emeritus of Radiology, Uppsala University, Faculty of Medicine, Sweden.

Medical Director Emeritus, Department of Mammography, Falun Central Hospital, Sweden.

Consultant Radiologist for numerous Comprehensive Breast Centers in the United States.

Project Leader, Randomized Controlled Breast Cancer Screening Project, Kopparberg County, Sweden, 1977- present

President of Mammography Education, Inc. 1986 - present

Doctor of Medical Sciences, Ph.D., Hungarian Academy of Sciences, 1978.

Associate Professor of Diagnostic Radiology,

University of Turku, Faculty of Medicine, Finland, 1982.

Associate Professor (1983) and Professor (1998) of Diagnostic Radiology,

Uppsala University, Faculty of Medicine, Sweden.

Doctor of Honoris Causa, March 2015, University of Pécs, Faculty of Medicine, Hungary

A novel approach to secure image encryption and decryption

N.Doğan and **A. İhsan**

Selçuk University Technology, Turkey

In this study, an innovative approach to image encryption and decryption is presented, employing a key sequence generated by a Linear Feedback Shift Register (LFSR) state sequence. The encryption algorithm provides a heightened level of security for image data, rendering it challenging for unauthorized entities to access or modify the content. The utilization of LFSR in generating key sequences ensures randomness and unpredictability, which are fundamental characteristics of any secure encryption system. Moreover, the XOR operation utilized in encrypting the image pixels is a straightforward yet effective technique that preserves the integrity of the original data while rendering it unintelligible to individuals without access to the key sequence. The encryption technique discussed in this study proves to be an exceptionally effective means of safeguarding sensitive image data. By employing a key sequence to scramble the data, it becomes virtually impossible for unauthorized entities to gain access to or tamper with the information. To evaluate the performance of this encryption scheme, several metrics are employed. These metrics facilitate a comprehensive comparison between the original and encrypted images, illustrating the successful preservation of data integrity through the encryption technique while rendering it incomprehensible to those lacking the key sequence.

Biography

Dr. Nurettin DOĞAN completed his undergraduate, graduate and doctoral studies at Ankara University. In recent years, he has studies in the field of Image Encryption and Artificial Intelligence.

Mediating processes in the relationships of abusive supervision with instigated incivility, CWBs, OCBs, and multidimensional work motivation

S.O. Onaran and **A. Göncü-Köse**

Çankaya University, Turkey

We examined how abusive supervision (AS) afected instigated workplace incivility, counterproductive work behaviors (CWBs), organizational citizenship behaviors (OCBs), and multidimensional work motivations (MWMs), in line with the Job Demands-Resources Model and Social Exchange Theory. We suggested that employees' identifcation with their workgroup moderates the link between AS and instigated incivility toward coworkers and that organizational identifcation partially mediates the association of AS with CWBs and OCBs. Furthermore, we hypothesized positive correlations between AS and external regulation as well as amotivation, consistent with the Self-Determination Theory. Finally, we predicted that jobrelated afective well-being would fully mediate the link between AS and autonomous work motivations while only partially mediating the link between AS and amotivation. Online surveys were used to collect data from 519 white-collar workers. The data revealed that AS was linked to a higher level of incivility toward coworkers. Furthermore, it was linked to both CWBs and OCBs, both directly and indirectly through organizational identifcation. Organizational identifcation mediated the associations between AS and MWMs as well. Finally, job-related afective well-being mediated the links of AS with external regulation, amotivation, and autonomous work motivations. Theoretical and practical implications of the fndings are discussed as well as suggestions for future research.

Biography

Sami Okan Onaran (M.S. in Social/Organizational Psychology) completed his undergraduate studies in Management department of Çankaya University in 2016. During his undergraduate studies, he got accepted to double-major program in Psychology department and completed his double-major in 2017. During the course of his education, he developed an interest in organizational psychology. Due to his interest, he wanted to get involved with practical experience and he worked in Human Resources department of ANDRITZ Hydro. As he was getting the practical experience, he remained dedicated to academia and obtained a master's degree in Social/Organizational Psychology from Çankaya University in 2020. He got his first publication in Current Psychology Journal (Onaran, S.O. & Köse, A. G., 2022). He is a section editor for "Human Resources Management and Services" and "Applied Psychology Research" Journals. Also, he remains engaged in peer-reviewing processes for these Journals and "Current Psychology" Journal.

Shape reversibility and crystallographic transformations in shape memory alloys

O. Adiguzel

Firat University, Turkey

A series of alloy system take place in a class of advanced smart materials by giving stimulus response to external effect. Shape memory alloys take place in this group by exhibiting a peculiar property called shape memory effect with the recoverability of two shapes at different conditions. This phenomenon is initiated with thermomechanical treatments on cooling and deformation and performed thermally on heating and cooling, with which shape of the material cycles between original and deformed shapes in reversible way. Therefore, this behavior can be called Thermoelasticity. This phenomenon is governed by two crystallographic transformations, thermal and stress induced martensitic transformations. Thermal induced martensitic transformations occur on cooling with cooperative movement of atoms in <110 > -type directions on a {110} - type plane of austenite matrix, along with lattice twinning reaction and ordered parent phase structures turn into the twinned martensite structures. The twinned structures turn into detwinned martensite structures with deformation by means of stress induced martensitic transformations. These alloys exhibit another property called superelasticity. This behavior is performed in only mechanical manner with stressing the material and releasing in elasticity limit in the parent austenite phase region, and shape recovery occurs instantly upon releasing, by exhibiting elastic material behavior. Superelasticity is performed in non-linear way, unlike normal elastic materials behavior, loading and releasing paths are different at the stress-strain diagram, and hysteresis loop refers to the energy dissipation. Superelasticity is also result of stress induced martensitic transformation and ordered parent phase structures turn into the detwinned martensite structures with stressing. Lattice twinning and detwinning reactions play important role at the transformations and driven by lattice invariant shears. Copper- based alloys exhibit this property in metastable β-phase region. Lattice twinning and lattice invariant shear is not uniform in these alloys and cause the formation of complex layered structures, The layered structures can be described by different unit cells as 3R, 9R or 18R depending on the stacking sequences on the close-packed planes of the ordered lattice. The unit cell and periodicity are completed through 18 layers in direction z, in case of 18R martensite in ternary copper-based alloys, and unit cells are not periodic in short range in direction z.

In the present contribution, x-ray diffraction and electron diffraction studies were carried out on copper based CuZnAl and CuAlMn alloys. X-ray diffraction profiles and electron diffraction patterns exhibit super lattice reflection. X-ray diffractograms taken in a long-time interval show that diffraction angles and intensities of diffraction peaks change with the aging duration at room temperature. This result refers to the rearrangement of atoms in diffusive manner.

Biography

Dr. Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has been retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last six years (2014 - 2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Also, he joined over 120 online conferences in the same way in pandemic period of 2020-2022. He supervised 5 PhD- theses and 3 M. Sc- theses. Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

Computer-assisted program for water Calco-Carbonic equilibrium computation

A. Hachemi and **A. Zeroual**

Higher National School of Hydraulics, Algeria

The risk of scaling or corrosion of pipes and household appliances has attracted special interest from the part of drinking water supply systems designers. To address these deficiencies, the Calco-Carbonic balance in water must be accurately maintained and evaluated using either the graphic methods, appreciation indexes, or computer programs. In this work, we developed a computer-assisted software for the computation of the Calco-Carbonic equilibrium of water based on Legrand Poirier's model. This software program, established in FORTRAN GNU with a graphical interface written with python using pyQt library pyqt5, provides two practical functions: evaluation of water Calco-Carbonic equilibrium numerically and graphically, and computation of the reagent rate required to make water neither aggressive nor encrusting. The program validation was carried out by comparing our results with those of the case considered by Legrand et al. (1981). In addition, the implementation of the program with two cases of water coming from reverse osmosis desalination plants of brackish water in the Sahara region and seawater in the Tipaza province shows for both stations, the technique of remineralization by carbonation is the best. Moreover, the results allowed us to choose between two remineralisations techniques among the eight techniques allowed applied in the case of brackish water desalination. It consists in adding lime and CO_2 or infiltration on an uncalcined dolomite bed. In the case of seawater, we applied the same carbonation remineralisation technique where the final Ca^{2+} value was set at 8°F (80 mg/l$CaCO_3$). These techniques ensured a quality of produced water that complies with drinking water standards. Abstract should give clear indication of the objectives, scope, results, methods used, and conclusion of your work. One figure and one table can be included in your results and discussions.

Biography

The author has been a teacher-researcher at the National School of Hydraulics since 2000. He received his doctoral degree in 2016 from the National School of Agriculture. Their areas of research concern: - groundwater modeling - water and wastewater quality - wastewater reuse and water desalination. He is currently working on the elimination of emerging micropollutants such as pharmaceutical micropollutants using membrane techniques (reverse osmosis and ultrafiltration). The last published paper is about developing a software for calco-carbonic equilibrium calculation using pyQt5 and fortran.

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Minimization of elliptic non-local functionals involving $\vec{p}\,(\cdot)$–Laplacian operator

M. S. B. Elemine Vall[2] and **A.Ahmed**[1]

[1]University of Sidi Mohamed Ibn Abdellah, Morocco
[2]University of Nouakchott, Mauritania

In this paper, we consider a non-local elliptic problem involving a $\vec{p}\,(\cdot)$-Laplacian operator. We show that for all t > 0 the problem has non-negative solution u(t) with $\lambda(u(t)) \rightarrow 0 \; as \; t \rightarrow +\infty$ and $\lambda(u(t)) \rightarrow +\infty$ as $t \rightarrow 0$ on the set $K(t) = \left\{u \in W^{1,\vec{p}(.)}(\mathbb{R}^N) : \int_{\mathbb{R}^N} \frac{h(x)|u|^{q(x)}}{q(x)}\,dx = t\right\}$ where $\lambda(u(t))$ where λ(u(t)) is the Lagrangian multiplier associated with u(t).

Heuristic green computing-based energy management with security enhancement using hybrid greedy secure optimal routing protocol

Bhavani Ravi[2], **Sheryl Oliver**[1], **R. Manikandan**[3], **Ashutosh Sharma**[4] and **Byung-Gyu Kim**[5]

[1]*SRM Institute of Science and Technology, India*
[2]*Saveetha Institute of Medical and Technical Sciences, India*
[3]*SASTRA Deemed University, India*
[4]*University of Petroleum and Energy Studies, India*
[5]*Sookmyung Women's University, Republic of Korea*

Green information technology (Green TI/GC) is provided by green computing, one of the emerging computing technologies in field of computer science engineering and technology. The main objectives of green computing are raising energy efficiency and lowering the use of hazardous materials. This Research propose novel technique in energy management with security enhancement based on heuristic green computing technique and optimised routing protocol. The energy management in green computing is carried out for enhancing the energy efficiency of the network using heuristic green computing technique. Then the security analysis has been carried out for secure data transmission of the network using Hybrid Greedy Secure Optimal Routing Protocol (Hy_GSOpRP). The suggested routing method is superior than the existing ones, according to simulation findings, in terms of MAPE of 62%, MLR of 55%, RMSE of 45%, energy consumption of 59%, network lifetime of 95%, delay of 40% and throughput of 98%.

Biography

Dr Bhavani R received her UG degree B.E(CSE) from Vellore Engineering College (Presently VIT University, Vellore, Tamil Nādu, India), PG degree M.E (CSE) & PhD from Anna University Chennai, India. She has 23 years of experience in reputed engineering colleges. Her publication papers include international journals of repute indexed under SCI and Scopus. She submitted project proposals to government funding agencies. She has a patent in Web Services and Artificial Intelligence.

Currently she is associated with Saveetha School of Engineering, SIMATS University as a Professor in the Institute of Computer Science and Engineering, Chennai. Her research interests include Artificial Intelligence, Machine Learning, Deep Learning, Data Mining Etc., She is a LIFE member of ISTE, IACSIT and IAENG. She was awarded with Best Woman Scientist Award for the year 2021-22 by Novel Research Academy.

Laser speckle applications in metrology

A R Arul

Department of Physics, Kumaraguru College of Technology, India

My research area is applications of laser speckle image processing in measurement techniques. One of the simplest measurements of thin film thickness using speckle photography is being taken in this session. The method was described for measuring the thickness of TiO_2 thin film coatings using speckle photography is a combination of laser, speckle patterns, and correlation analysis. The first layer of TiO_2 coating is applied to a steel substrate using the spin coating method. A coherent laser is illuminated on the coated surface, and the scattered laser creating a speckle pattern. This speckle pattern contains information about the characteristics of the first layer, including its thickness. The speckle pattern is captured using an imaging device, such as a CCD camera, which records the pattern. The captured speckle image is auto-correlated to analyse the pattern and identify features related to the first layer of TiO_2 coating. Another layer of TiO_2 coating is applied on top of the existing coating. After applying the second coating, another speckle image is recorded using the CCD camera. The second speckle image is cross-correlated with the previously captured speckle image from the first coating. This process calculates the pixel distance shift between the two speckle images. The pixel distance shift obtained from the cross-correlation corresponds to the change in thickness of the TiO_2 thin film due to the second coating. By using a calibration or conversion factor that relates pixel distance to film thickness, the algorithm computes the thickness of the TiO_2 thin film for the second layer. By repeating this process for subsequent coatings, Laser speckle image processing provides a non-destructive and potentially precise method for monitoring the growth of thin films. This is confirmed by the conventional Stylus Profilometer method. This technique is used in various applications in material science, surface engineering, and other fields.

Biography

Capt A.R.Arul is an Assistant Professor in the Department of Physics, School of Foundational Sciences at Kumaraguru College of Technology. Coimbatore, Tamilnadu, India. He received his Master of Physics degree in Bharathiar University, Coimbatore in 2002 and Master of Philosophy degree from the Department of Physics, Bharathidasan University, Trichy, Tamilnadu, India, in 2006. He has 17 years of teaching experience in Physics. He has in-depth experience in thinfilm Technology and Optical studies by Laser. He has published a good number of publications in this area. He is working with different research group in various projects in this area.

Dual Iterative algorithm for hybrid beamforming in mm wave downlink massive multi-user MIMO Systems

Shweta Shah and **Krupali Umaria**

Department of Electronics Engineering, Sardar Vallabhbhai National Institute of Technology, India

Signal loss is a fundamental challenge in communication systems, and Multiple Input Multiple Output (MIMO) systems are no exception, particularly in Millimeter-Wave (mm-Wave) or massive MIMO setups. One effective approach to address this issue is by utilizing beamforming gain. However, advanced MIMO systems require intelligent beamforming controllers to ensure optimal signal reception. In this study, we propose a solution called Hybrid Beamforming, which combines both analog and digital beamforming techniques. By doing so, we can effectively mitigate signal loss and enhance the performance of mm-Wave downlink massive multi-user MIMO systems. To implement our proposed algorithm, we adopt a fully-connected structure. Our primary focus is on maximizing the overall system's performance in terms of sum-rate and power efficiency. To achieve this goal while minimizing computational complexity, we employ a successive approximation method to design the Digital Beamforming.

The Analog Beamforming component is essential to optimize the system's performance further. For this, we propose a dual iterative algorithm based on the criterion of minimizing path loss. This algorithm consists of both outer and inner iterations, contributing to the maximization of the sum-rate and improvement of power efficiency. Through extensive evaluations, we compared the performance of the proposed dual iterative algorithm with other state-of-the-art methods. The results clearly demonstrate that our approach outperforms these methods in terms of both sum-rate and power efficiency, regardless of the number of base station (BS) antennas, whether they are large or small. In conclusion, our study presents a novel solution, Hybrid Beamforming, to enhance the performance of mm-Wave downlink massive multi-user MIMO systems. The proposed dual iterative algorithm effectively optimizes the system's performance, outperforming existing methods in terms of sum-rate and power efficiency. This research contributes to addressing the challenges posed by signal loss in MIMO systems, ultimately improving communication system reliability and performance.

Biography

Dr. Shweta Shah is an Assistant Professor at the Electronics Engineering Department of Sardar Vallabhbhai National Institute of Technology (SVNIT) in Surat, Gujarat, India. She has been associated with SVNIT since 2004. Dr. Shah holds a BE in Electronics and Communication Engineering (2004), an M.Tech. in Communication Systems (2008), and a Ph.D. in Wireless Communication (2015).

Throughout her career, she has taken on various administrative and academic responsibilities and has been actively involved in mentoring students. Dr. Shah has guided numerous UG and PG projects, with 5 Ph.D. scholars successfully defending their viva-voce under her guidance.

Her research work has resulted in numerous accolades, including 30+ reputed Journal, and 21 international conference publications, 6 book chapters, and co-authoring a book. Additionally, she holds three registered patents.

Dr. Shah has been actively engaged in several projects, including two funded by ISRO and a DST funded project under her mentorship. She has also organized over 20 programs related to wireless communication, IoT, GNSS, and delivered 40 expert talks.

Furthermore, she is an active member of various professional societies, such as IEEE, IETE, ISTE, and ION. Presently, she serves as the Associate Dean of Student Welfare at SVNIT and is also the SSIP coordinator at the incubation center of ASHINE.

Pure/Hybrid soft materials for water purification and environmental applications

Kuldeep Kumar Raina[1] and **Ravi K. Shukla**[2]

[1]M.S. Ramaiah University of Applied Sciences, India
[2]Department of Physics, School of Physical Sciences, DIT University, Dehradun, India

Liquid crystals, hydrogels, polymer membranes, and biopolymers are the subsets of the elite class of soft materials. These materials in virgin/ hydride form have emerged as promising tools for pollutant removal, water purification, and enhancement of air quality. Key factors like tunable surface interfaces and high surface area-to-volume ratios and surface functionalities enable them for efficient adsorption and catalytic degradation of contaminants/ pollutants. In another aspect, such materials offer design flexibility, allowing customization for specific pollutants and environments, and minimizes adverse ecological impacts, demonstrate a significant contribution to advancing environmentally-friendly practices, ensuring cleaner ecosystems, and fostering a greener future. In this context, a new application of lyotropic liquid crystalline (LLCs) soft materials has been addressed to degrade various anionic and cationic dyes. LLCs offer large surfaces with long-range ordering and functionalities to interact with dye contaminates of polluted water and degrade them through noncovalent interactions/charge transfer mechanisms. Such LLCs can be seen as a highly effective, reactive, and cost-effective alternative for the adsorption/ degradation of the contaminations.

Geo-spatial crime density attribution using optimized machine learning algorithms

Boppuru Rudra Prathap

Christ Deemed to be University, India

Law enforcement agencies use various crime analysis tools. A large amount of crime data has enabled crime analysis. The proposed methodology in this study analyses crime-type data using Kernel Density Estimation (KDE) in a Geographical Information System (GIS). Bangalore and India newsfeeds are being considered for testing purposes. The study uses Bangalore and India newsfeeds for experimental purposes and identifies that the bandwidth of the Geographical information system influences the visualization of crime density. The research aids in visually determining the appropriate bandwidth for the problem using an optimized KDE algorithm. The proposed KDE model achieved a predictive performance of 77.49%. The research concluded that news feed data might be used to extract spatiotemporal information on the forecast performance of different forms of crime and that our crime prediction model was equal to the ARIMA model in predicting performance. The diversity of criminal trends is visualized in a customizable way using a data-mining tool. In the future, this work can be extended to topic modeling in text analysis to reduce false acceptance ratio, and TV news channels (video analysis) can also be used as a source of data. More number Crime Keywords may be considered for accurate prediction.

Biography

Boppuru Rudra, PhD, is Associate Professor of Computer Science Engineering at Christ University in Bangalore, Karnataka, India. He has written a number of publications on crime analysis and forecasting using machine learning techniques. During his scientific research journey, he has published several papers that have been highly cited and recognized in local and international journals and conferences. His expertise and research areas include machine learning, image processing, cyber security laws and data privacy, and cloud computing security. He holds a bachelor 's degree in information technology, a master 's degree in software engineering, and a doctorate in computer science and engineering.

Multiresolution analysis for Parkinson's Disease detection

Thasleema T and **M Shibina V**

Central University of Kerala, India

Parkinson's disease (PD) is a neurodegenerative disorder that primarily affects the central nervous system and gradually deteriorates the neurons. Early and accurate detection of PD is essential for its effective management and therapy. To accomplish this, researchers have looked into the potential of speech analysis as a non-invasive method to distinguish between those with PD and healthy controls. This paper aims to develop a method to detect Parkinson's disease (PD) using Wavelet feature (DetParWav). The multiresolution analysis nature of wavelet features would help to detect the disease in powerful way. The extracted features are applied for dimensionality reduction using Principal Component Analysis (PCA). Mutual information gain. It was then applied with Mutual Information Gain to calculate the dependence between two variables. Then reduced feature subsets are evaluated using SVM RBF and Decision Tree and obtain the highest accuracy of 91.01% and 88% respectively. The experimental analysis shows that these approaches provide reliable computational tools for accurately detecting the presence of Parkinson's Disease (PD).

Biography

Dr. Thasleema T M, working as Assistant Professor, Department of Computer Science at Central University of Kerala. She has obtained her Ph.D in Computer Science from Kannur University. Her research and development interests include Artificial Intelligence, Digital Signal Processing, Machine Learning, Digital Speech Processing and Natural Language Processing. She has more than 30 research articles into her credit published by international journals and conferences of repute. Recently she has been awarded with a design patent for modelling a helmet for the epilepsy detection. Her publications have obtained about 265 citations from contemporary researchers and an H-index of 4. She has been actively involved with research and development activities and also an active member of IEEE.

A review on the properties of recycled aggregate concrete incorporating supplementary cementitious materials

Sahil Abbas Zaidi, M. Arsalan Khan and **Tabassum Naqvi**

Aligarh Muslim University, India

The increasing demand for concrete production is contributing to the pollution of our natural environment. The carbon dioxide emissions resulting from cement production which is being utilized in concrete production are significant contributors to global warming. Additionally, the continual use of natural stone aggregates is depleting our finite reserves of such resources. Numerous research studies are currently underway to tackle the environmental issues associated with use of cement in concrete manufacturing.

The utilization of recycled aggregates (RA) derived from old construction and demolition waste (CDW) has attracted considerable attention among scholars seeking sustainable alternatives. Nonetheless, the incorporation of RA faces drawbacks, including high water absorption, porosity, as well as challenges related to workability and mechanical properties. To address the limitations of recycled aggregate concrete (RAC), prior investigations have explored the introduction of supplementary cementitious materials (SCMs) such as silica fume, fly ash, and nano-silica, etc. These additives, possessing advantageous filling and pozzolanic attributes, have been used to partially replace cement in concrete compositions. This approach not only reduces cement consumption but also enhances concrete's mechanical strength, durability, and microstructural characteristics.

This study presents a comprehensive assessment of earlier research studies in the realm of sustainable concrete development. Various techniques for sustainable concrete production are examined, particularly focusing on the utilization of recycled aggregates and supplementary cementitious materials. It is evident that RAC exhibits inferior properties compared to concrete made with natural aggregates. However, the incorporation of specific supplementary cementitious materials holds the potential to elevate the properties of RAC to meet or even surpass those of NAC.

Biography

The presenter is a research scholar in the Department of Civil Engineering, Zakir Husain College of Engineering and Technology, Aligarh Muslim University, Aligarh (India). The co-authors are the Ph.D. supervisors of the presenter. The presenter's research interests include- sustainable concrete development, properties of recycled aggregate concrete (RAC), use of supplementary cementitious materials (SCMs), properties of fiber-reinforced concrete (FRC), seismic analysis, soil-structure interaction, etc.

Evaluation of rheological and mechanical properties of bottom ash based masonry mortar with graphene oxide

Prabakaran V and **Ramadoss P**

Department of Civil Engineering, Puducherry Technological University, India

This paper evaluates the rheological and mechanical properties of lignite based bottom ash as fine aggregate in cement mortar with GO as an additive. The annual extraction of such a huge amount of bottom ash needs a massive transfer to the field, as it constitutes a threat to the environment. The utilization of such residue as a partial replacement of fine aggregate in masonry mortar is not fully explored. Hence, an attempt has been made to utilize the bottom ash as FA in cement mortar composites, and studied the influence of graphene oxide (GO) in the properties of mortar matrix. In this study, bottom ash replacement from 0-60% and GO at dosage of 0.1, 0.15 and 0.20% by weight of cement were used. Compressive and flexural strengths of composites were improved significantly at GO = 0.15%. Mechanical properties at 40% bottom ash replacement level only have shown minor improvement. It was observed from the flow table test that addition of bottom ash leads to reduction in workability of masonry mortar, and GO enhanced both the rheological and mechanical properties of mortar matrix.

Biography

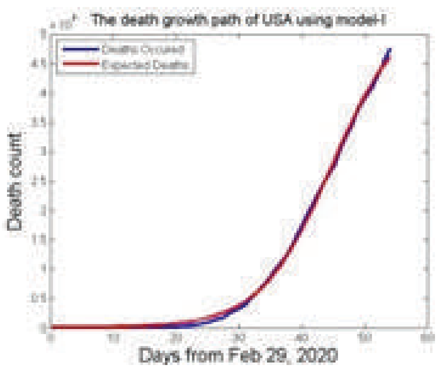
He currently holds the position of Associate Professor of Civil Engineering at the Puducherry Technological University, Puducherry. He has more than 27 years of teaching experience. His present research focuses on advanced engineered composites with grapheme oxide as nanomaterial, self curing concrete, and the use of waste materials from industries, among other things. He have published papers in national and international journal and conferences. His area of expertise is structural engineering. He was a member of several professional organizations, such as the Indian society for technical education, the Indian Concrete Institute, and the Institution of Engineers (India), etc.,

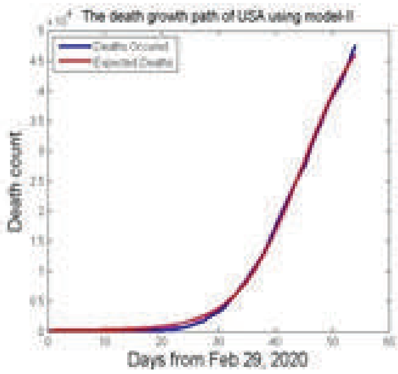
The prediction of the lifetime of the new coronavirus in the USA using mathematical models

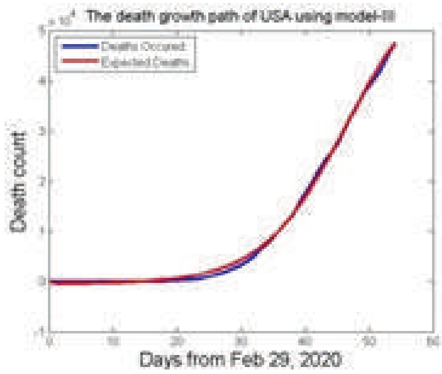
K. Selvakumar

Anna University, India

The World Health Organization (WHO) on December 31, 2019, was informed of several cases of respiratory diseases of unknown origin in the city of Wuhan in the Chinese Province of Hubei, the clinical manifestations of which were similar to those of viral pneumonia and manifested as fever, cough, and shortness of breath. And, the disease caused by the virus is named the new coronavirus disease 2019 and it will be abbreviated as 2019-nCoV and COVID-19. As of January 30, 2020, the WHO classified this epidemic as a global health emergency (Chung et al. in Radiology 295(1):202–207, 2020). It is an international real-life problem. Due to deaths, globally everyone is in fear. Now, it is the responsibility of researchers to give hope to the people. In this article, we aim to better protect people and general pandemic preparedness by predicting the lifetime of the disease-causing virus using three mathematical models. This article deals with a complex real-life problem people face all over the world, an international real-life problem. The main focus is on the USA due to large infections and death due to coronavirus and thereby the life of every individual is uncertain. The death counts in the USA from February 29 to April 22, 2020, are used in this article as a data set. The death counts of the USA are fitted by the solutions of three mathematical models and a solution to an international problem is achieved. Based on the death rate, the lifetime of the coronavirus COVID-19 is predicted as 1464.76 days from February 29, 2020. That is, after March 2024 there will be no death n the USA due to COVID-19 if everyone follows the guidelines of WHO and the advice of healthcare workers. People and government can get prepared for this situation and many lives can be saved. It is the contribution of soft computing. Finally, this article suggests several steps to control the spread and severity of the disease. The research work, the lifetime prediction presented in this article is entirely new and differs from all other articles in the literature.







And, based on the death rate, the Model-I, Model-II, and Model-III give 1285.12 days, 1281.33 days, and 1464.76 days, respectively, from February 29, 2020. On taking the maximum value, it is predicted from three models, after 1464.76 days from February 29, 2020 (that is, after March 2024), there will be no deaths due to COVID-19 and, on comparing with the live updates of WHO we can expect no infection and no death in the USA due to COVID-19 after March 2024, if everyone follows guidelines of WHO and advice of healthcare workers. The best model among the five-parameter and six-parameter models is Model-III (the six-parameter model) predicts the lifetime of coronavirus COVID-19 in the USA as 1465 days from February 29, 2020.

Biography

Dr. K.Selvakumar aged 59 was born on June 20, 1964, in India. Completed M.Sc. in Mathematics in 1086, Ph.D. in Numerical Analysis in 1993, M.E. in Computer Science & Engineering in 2013, and going to submit a thesis for Ph.D. in Computer Science & Engineering in 2023. Currently working as an Assistant Professor in Mathematics at Anna University, University College of Engineering, Nagercoil, Tamilnadu, India. Published more than 75 articles. Research interests include Numerical methods, cloud computing, DNA computing, Network analysis, cancer research, and coronavirus research works.

Triple surrounding gate germanium source MOSFET with step graded channel biosensor

R.S. Gupta[1] and **Amit Das**[2]

[1]*Maharaja Agrasen Institute of Technology, India*
[2]*Jawaharlal Nehru University, Delhi, India*

In recent times, MOSFET has emerged as the top choice in the biomedical field for label-free biosensing applications. The preference for MOSFET stems from its versatility and scalability, leading to high sensitivity in detecting biomolecules. Label free biosensing eliminates the need for labelling, reducing fabrication complexity and cost. The surrounding gate architecture provides superior control over the flow of charge carriers. The sensitivity of the surrounding gate MOSFET can be further enhanced using various engineering techniques, including source engineering (utilizing germanium as a source material), gate oxide engineering (utilizing gate oxide stacking of SiO2 and HfO2), gate engineering (employing a triple surrounding gate architecture), and channel' engineering (utilizing tri step graded doping). Each engineering technique has its advantages and limitations, so the choice of additional engineering techniques for enhancing sensitivity must align with specific biosensing applications. MOSFET based biosensor relies on the principle of dielectric modulation to detect biochemical species. Therefore, a triple surrounding gate germanium source MOSFET with a step-graded channel based biosensor (TSG-GSM-SGCB) has been presented here, whose sensitivity is exceptionally high due to its integrated structure, as illustrated in figure 1. Table 1 presents a comparison of the proposed biosensor's high sensitivity with other FET based biosensors available in contemporary literature. Device level simulations of the TSG-GSM-SGCB can be performed using the SILVACO TCAD simulator, enabling the study of sensitivity patterns under various operating conditions. Biomolecules are modelled within the simulator as materials with finite dielectric constants and charge densities. The proposed analytical model typically neglects quantum effects and is based on Poisson's equation, which can be further solved using the superposition principle. The superposition principle simplifies the complex Poisson's equation into 1D and 2D equations, which can be easily, solved using appropriate boundary conditions.

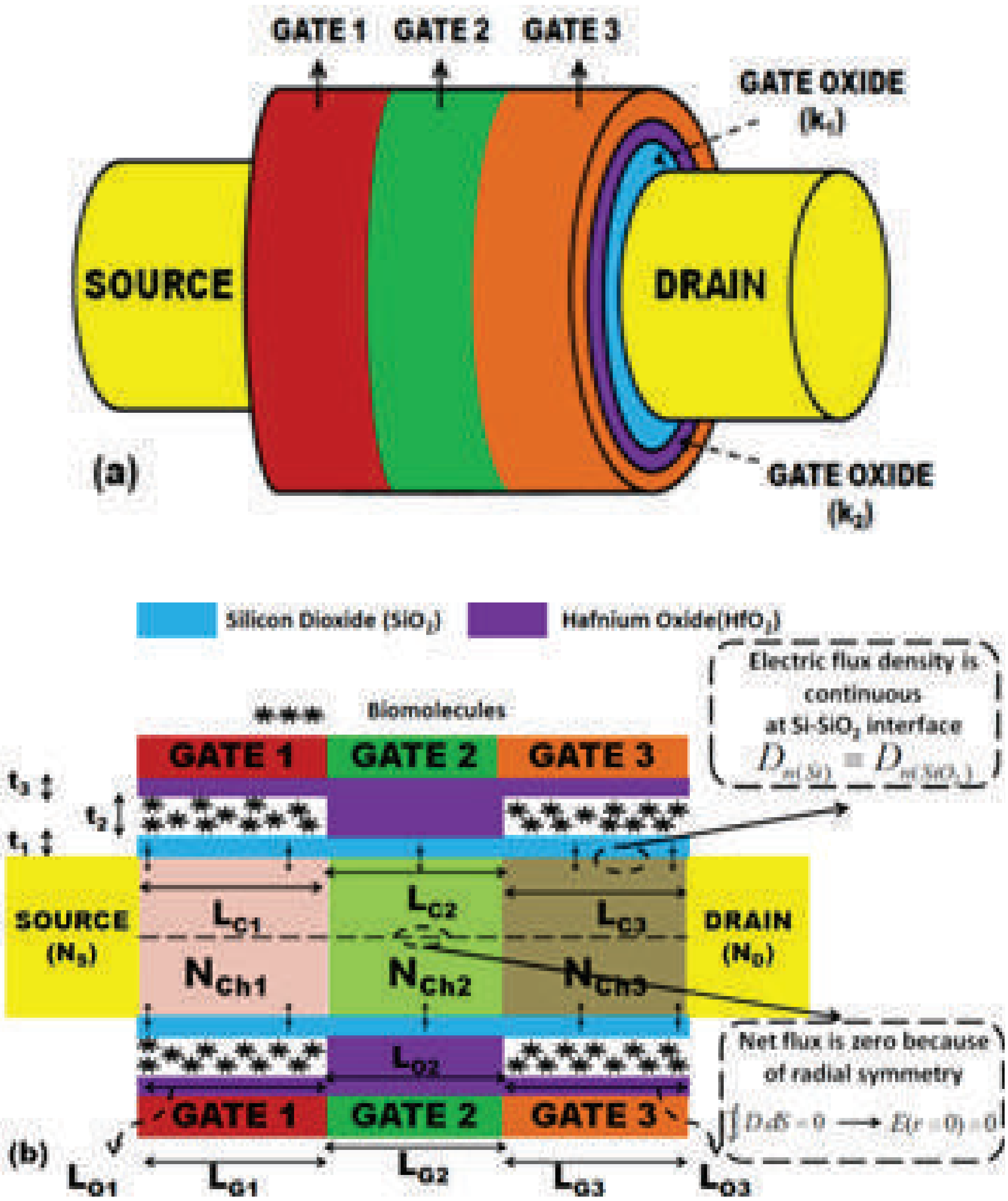


Figure 1. (a) 3D cylindrical structure and (b) 2D cross sectional view of TSG-GSM-SGCB.

Table 1 Benchmarking the threshold voltage sensitivity of TSG-GSM-SGCB with similar biosensors available in the contemporary literature..

Structural Parameter	Reference [1]	Reference [2]	Reference [3]	Reference [4]	This Work
	DM-DG-JL-MOSFET	**GaN-GME-DE-SNW-FET**	**QG-MC-MOSFET**	**TGAA-NWFET**	**TSG-GSM-SGCB**
Length of Cavity	25 nm	15 nm	20 nm	10 nm	29 nm
Gate Oxide	SiO_2+TiO_2	Al_2O_3+HfO_2	SiO_2+Si_3N_4	SiO_2+HfO_2	SiO_2+HfO_2
Thickness of Cavity	9 nm	4 nm	9 nm	1 nm	6 nm
Length of Channel	100 nm	50 nm	40 nm	20 nm	60 nm
Cavity Type	Dual Sided	Dual Sided	Dual Sided	Single Sided	Dual Sided
K_{bio}	10	8	12	2.1	8
S_{Vt}	0.227 V	0.105 V	0.161 V	0.0172 V	0.261 V

Progress of nanomaterial from biofuels to biomedical science

Hari Singh[1] and **A. K. Sinha**[2]

[1]*RIMT University, India*
[2]*CSIR-IIP Dehradun, India*

The work focuses on the advancement of nanomaterial in the field of biofuels, bioenergy and imaging and biomedical technologies. We propose to develop new porous acidic catalysts such as Ni/NiO catalyst to produce lubricating oil from sustainable sources such as jatropha oil, used cooking oil and cater oil. The Ni/NiO catalyst synthesized by co-precipitation and the wet impregnation method. The catalyst can reduce to 450°C and 30 bar hydrogen pressure for 2h for activation. The lubricating oil will be generated in two steps, first is transesterification plant oil using methanol and potassium hydroxide to yield biodiesel. Hydro processing route for conversion of Jatropha oil to aromatic free biofuel using Ni/NiO is reported (Figure 1). The second step is partial hydrogenation of biodiesel at 90°C at 5-10 bar hydrogen pressure. The final product will be analysed by gas chromatography, FTIR and viscometer. Ni/NiO is one of best nanomaterial for hydrogenation of biomass-derived feedstocks to produce lube oil (Table 1). It has only drawback of toxicity therefore, we synthesized iron incorporated Gd-based nanomaterials termed as INP-Gd and its application in biomedical field. Synthesized INP-Gd has small particle size (110 nm), donut shape, soluble in DMSO, non-toxic till 100 ug/ml for 72h, having porous and amorphous nature(Table 1).

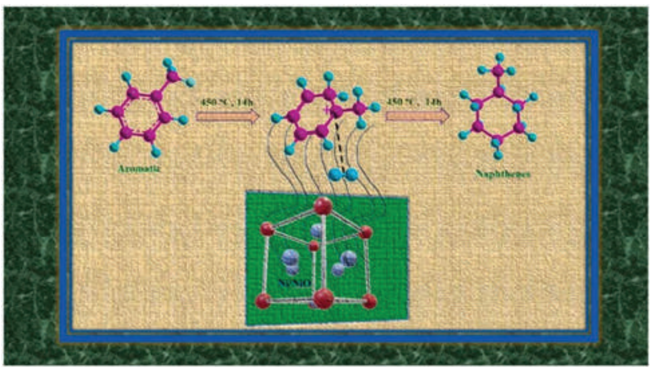


Figure 1: Ni/NiO catalyst showed complete conversion of aromatics to cycloalkanes at the optimal reaction conditions at 150 °C, and 100 bar, for 14 h.

Table1: Hydrogenation of cashew nutshell oil using different nanomaterials.

Catalysts	Reaction condition	Solvent used	X (%)	Mode of reaction	Products
Pd/C	$T=250^0$ to 300^0C P= 40 bar	Solvent free	98	Hydrogenation	Linear alkanes (C14 to C20)
Ni/NiO	$T=200\text{-}300^0C$ P=50 bar	Octane	100	Hydrogenation	Cyclohexane, Phenol, Tetradecane,
$RuCl_3$	$T=80^0C$	Isopropanol	98	Hydrogen transfer, homogenous	Monoene
$5\%Pd/Al_2O_3$	$T= 300^0C$ P=70 bar	Heptane	95	Hydrogenation	Dodecacyclohexanone, Hydrogenated cardanol, ring opened C20

Biography

Dr. Hari Singh, Assistant Professor and head of chemistry department RIMT University Punjab,India He worked in the CSIR- IIP Dehradun as a research assistant. He was one of the team members who made bio-jet first from non- edible oil (Jatropha oil) and tested in spice jet flight, India on 28 Aug 2018. He obtained his Ph.D. degree in Chemistry (2019) from the Academy of Scientific and Innovative Research (AcSIR)/CSIR-Indian Institute of Petroleum, Dehradun (India). He is expertise in material chemistry, physical chemistry, catalysis, inorganic chemistry, biofuels, and surfactants. He has supervised two M.Phil. Chemistry thesis at RIMT University. He authored about eighteen peer-reviewed journal articles with more than 140 citations. He worked on Synchrotron radiation (EXAFS) at (RRCAT) Raja Ramanna Centre for Advanced Technology, Indore, (Unit of Bhabha atomic research centre). He also got the opportunity to work for India Glycol Limited, Kashipur, Uttarakhand. He published two books.

Enhancing sustainability of polypropylene band and bamboo-reinforced structural elements for rural low cost housing

M. Anusha[1] and **H. J. Surendra**[2]

[1]*Niite School of architecture, India*
[2]*Atria Institute of Technology, India*

In search of sustainable development this study gives the vision of evolutionary growth in construction industry. As said by Buckminster Fuller "You never change things by fighting the reality. To change something, build a new model that makes the existing model obsolete. "The dream of having a house is a challenging task for low and moderate-income earners in developing countries. Low-cost housing techniques can be adapted to achieve an environmentally friendly and innovative construction to overcome the problem. The materials like Bamboo and Polypropylene band (PP) have been considered as sustainable building materials for the replacement of steel in this present research. Bamboo is a construction material that has been used for a long period for rural housing techniques. Many researchers have determined that bamboo has high tensile strength properties and is also easily available. It is possible to lower the cost of the construction by using bamboo as the main reinforcement. Polypropylene (PP) band, which is rarely used as a building material in India which is strong has heat resistance and is lighter in weight. The main objective of this study includes that, strength parameters such as flexural strength, compressive strength of the reinforced concrete beam can be achieved by using bamboo as the main reinforcement and Polypropylene band as vertical stirrup that can reduce the cost by 85% and helps to achieve lightweight structure. The establishment of stable analytical model proves to be cost effective by reducing the number of test specimens for experimental work. This research targets to compare experimental investigations with FEA approach. The Finite Element Analysis (FEA) is carried out using ABAQUS for model geometry to observe experimental study. MATLAB application has been used to validate the structural behaviour through parametric studies like shear force and bending moment diagram using 3-point loading beam.

Biography

B.E (CIVIL),M.TECH(STRUCTURAL ENGINEERING)

C 001, Master Classic residency, Surabhi layout, Jakkur main road,Yelahanka Old town, Bengaluru-64 Karnataka, India

RESEARCH FUND RECEIVED:

1. Received fund from KARNATAKA SCIENCE AND TECHNOLOGY ACADEMY (KSTA) for the project "A feasibility study on Reinforced stabilized earthen block with Brinjal stem fiber for Rural Housing".
2. Received fund from KARNATAKA SCIENCE AND TECHNOLOGY ACADEMY (KSTA) for the project "Civil Engineering development and Applications for Sustainability".
3. Received fund from ABIC of ATRIA INSTITUTE OF TECHNOLOGY for the student innovative project "Sustainable low cost housing technique using polypropylene band and bamboo reinforced structural elements for rural housing".

ACHIEVEMENTS:

1. Won the 2nd prize in the SRISHTI-State Level engineering students project exhibition competition 2022

Title: Sustainable Low-cost housing technique using Polypropylene band and Bamboo reinforced structural elements for rural housing.

Venue: BMS College of Engineering

Date: 25th- 27th July,2022

Secured 2nd place in Project exhibition event as a part of SRISHTI 2022 (Innovation Exchange)

2. Selected for VTU Educational Conclave 2022 (Engineering Excellence)

Title: Sustainable Low-cost housing technique using Polypropylene band and Bamboo reinforced structural elements for rural housing

Venue: Gayathri Vihar, Palace Grounds Bengaluru

Date: 31st july & 1st August 2022

3. Won the first prize in Innovative Startup in MoEs Institutions Innovative council regional Meet 2022

Title: Sustainable Low-cost housing technique using Polypropylene band and Bamboo reinforced structural elements for rural housing.

Venue: Reva University

Date:16th of August,2022

Secured 1st place in Innovation Startup in MoEs Institutions Innovative Council Regional meet 2022

Preparation, characterisation and electrical properties of ZnAlMnO – SWCNT nanocomposites

P. Raju[1], T Hrishikesh Kumar[2], K Bhanu Prasanna Kumar[2], T Ganesh[2], M. Sunnith Reddy[2], S.E Naina Vinodini[2] and **G Neeraja Rani[1]**

[1]*Geethanjali College of Engineering and Technology, India*
[2]*Government City College, India*

Aluminium and Manganese doped Zinc oxide (ZnO) nanostructures with the general formula $Zn_{0.9}Al_{0.07}Mn_{0.03}O$ (ZN) were prepared using a simple and affordable wet chemical coprecipitation method. Nanocomposites of $Zn_{0.9}Al_{0.07}Mn_{0.03}O$ (ZN) and single-walled carbon nanotubes (SWCNTs) prepared by solid-state mixing method. The content of the SWCNT filler is varied as 1, 2, 3, 4 and 5 Wt. %. X-ray diffraction (XRD), and Raman spectra revealed good compatibility between ZN and SWCNTs. A pure ZN sample was found to have a single crystalline phase that is ZnO-specific and has a wurtzite structure. All the nanocomposites show good crystalline in nature, and no impurities were found. From the Raman spectra, it is observed that the increase of the IG/ID ratio of the ZC5 in comparison with ZC1 suggests the presence of more organized carbon in the sample. The dielectric analysis was carried out to distinguish between the grain and grain boundary contributions to the system. The dielectric property was strongly affected by increasing the dopant concentration. The dielectric constant (ε) and dielectric loss (tan δ) factors decrease with the increase in frequency only up to a certain limit. The a.c. conductivity also increases with the increase in frequency. Both electrical and dielectric properties of the nanocomposites enhanced with the increase in the doping concentration of SWCNT.

Effect of grain size on fatigue life of Inconel 718 superalloy post wire electric discharge machining

Baibhav Kumar, Anshuman Piyush, Anant Vohra and **Qasim Murtaza**

Delhi Technological University, India

In this study, Inconel 718 is systematically classified into three grain sizes: fine, medium, and coarse. These parts are then subjected to wire EDM machining in three separate conditions to produce machining patterns named Rough, Trim3, and Trim5. The resulting 3x3 factorial design allows for a thorough investigation of the relationship between particle size and processing methods. Processed specimens are carefully inspected with particular attention to surface roughness, residual stresses and fatigue life. Statistical analysis, including analysis of variance (ANOVA), was used to describe the relationship between particle size, sample processing area, and the results of the three tests. Our findings show a significant relationship between residual stress and surface roughness in a subset of mechanical models, supported at a 95% confidence level. Other hypotheses were not well supported. To ensure clarity, the microstructure of the fabricated samples was carefully examined by fractography and scanning electron microscopy (SEM). In addition, ABAQUS/Standard analysis of four bending tests on Inconel 718 was performed and the results were satisfactory. This comprehensive approach provides valuable insight into the complex relationships between particle size, processing methods and material properties. These findings contribute to a solid foundation for further exploration and application in materials science and engineering.

Biography

Baibhav Kumar and his co-authors are sophomore of Delhi Technological University, BTech in Mechanical Engineering. Baibhav Kumar has been inclined towards advance material sciences and has vast research experience with recently been selected for MITACS GRI and completed his research studies in ETS Montreal, Canada. He has been passionate towards applied engineering and has been active student in varied international completions.

Modelling approaches for estimating water losses of an ecosystem using light radionuclides

Niranjan Kumar

Applied Sciences Harvard University & Harvard Business School Harvard University, USA

A detailed and exhaustive comparative study for calculating and modelling water losses from thedifferent surface water sources as well as by the tree is researched and after that the nuclear chemical methods model was implemented to compare the process and result accuracy;limitation and peculiarity in running this model and was investigated and described in comparison with SWAT (soil; water and tree components) and DEM modelling approaches after rain or in dry. The noble approach for determining the evapotranspiration is conducted using chemical nuclear isotopic method for two fresh water stream and the straight forwardness of this method is quite a high level in accuracy and relevent for the fresh water stream of rectangular channel provided the flow having 0.6 m/sec evaporated by cross sectional area of 1.72 sqm having the discharge 0.172 cumec of water which evaporating 840 lit per day of water in the stream length 3.5 km while the 0.1 m/sec flow in pistia cover stream of smaller stretch Phudphora having area of the cross section 3.23 sqm and the 0.1938 cumec; water volume passing every second through it evaporated 426.19 lit per day in a stream length of 1.4 km;water including 46.35 lit/d by the pistia alone in surface area cover of …..by the transpiration rate 0.01925mg/ml/day/sqcm. The gas chromatograph sample volume of 3 ml water in which measured concentration of 0^{18} ($t^{1/2}$ =100 days) nuclides was 63 ppm on an average and solubility of dissolved nitrogen were found 16 ml/lit in the stream water for production of nuclides; along with it transpirational water losses in 15 tree species were also calculated. Betula bhojpatra and Dalbergia sisso species found loosing water at maximum rate and the correlation factor with moisture contains is r=0.09 and correlation between Concentration and O^{18} is r=0.029.While surface soil of the forest area loosing water at the 0.00043g/g/day/cm2

Biography

Author is currently the Professor in John a Paulson School of Engineering and Applied Sciences USA and interim CEO of a Company Kumar International R&D consultant Pvt Ltd and authored several books and Research Manuscripts in international journals and had several pioneered science work patent in his name and contributed in the establishment of Department of Advanced studies in radiation Science and Radioecology in Asian region. Many of his research work is transformed in animated film. Author work for Ministry of Defence India as well. And Recipient of many national and international awards. And the Editorial boards member of the international journals Earth Science of SPG USA.

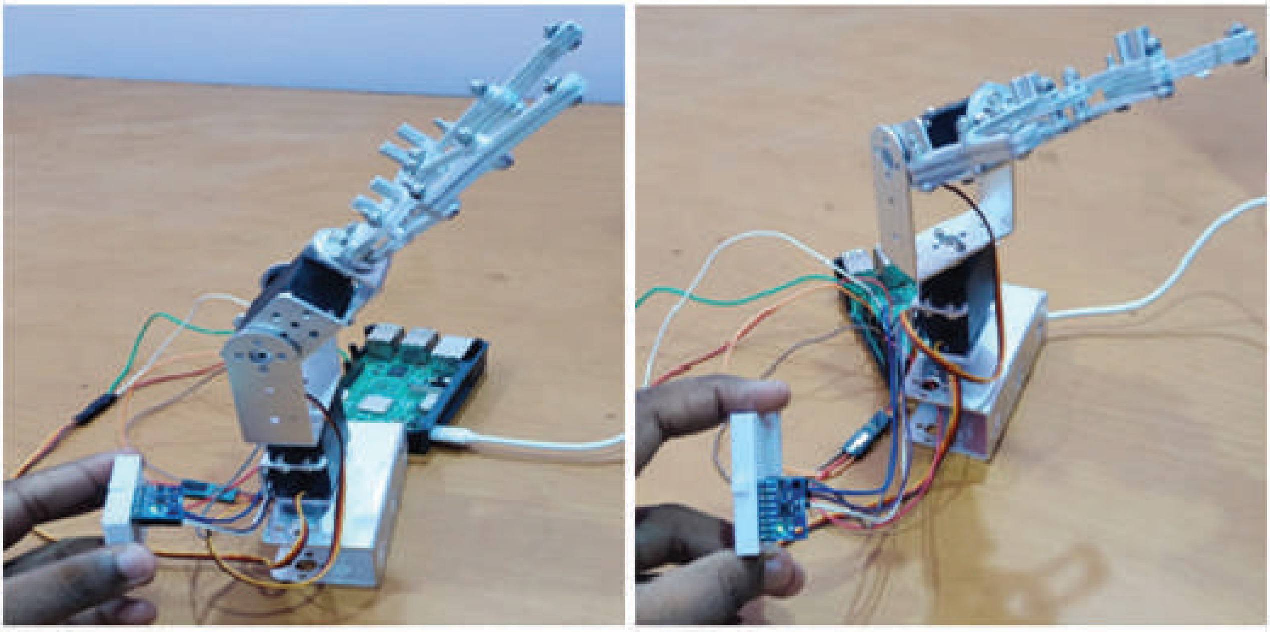
Design of Assistive Robotic Arm (ARA) for disabled and elder people

S S Kiran and **K Gurucharan**

Lendi Institute of Engineering & Technology, India

This research describes a Multimodal Adaptive Wireless Control System (MAWCS) for disabled and elderly people using an Assistive Robotic Arm. The wireless sensor body network (WSBN) is used to receive the user's upper body motions and voice commands from 3 nodes in the specified system. A wearable headset with an Inertial Measurement Unit (IMU) sensor measures head and upper body movements. The sensing element is 2.9cm long and 2.9cm wide, consumes 11mW, and has high angular precision. Surface electromyography measures muscle activation. Multiple Inertial Measurement Unit and Electromyography sensor nodes are implanted on the patient to record body and muscular movement. These 2.5 cm-long, 4.0 cm-wide nodes consume up to 11mW. A Raspberry Pi controls the proposed Body Machine Interface. The Assistive Robotic Arm (ARA) can be operated by voice commands, head movement, or muscle movement. Compared to the Mobile application, the proposed MAWCS and ARA would help users complete simple daily tasks with only 30% time overhead. The proposed control interface is more friendly to people with disabilities who cannot use a joystick. In a completely paralysed patient, voice instructions can control it. The ultimate goal is to help disabled and elderly persons with this helpful arm live daily. The main goal of this work is to design and build a Multimodal Adaptive Wireless Control System (MAWCS) to help disabled and elderly people with daily tasks. The research seeks to integrate a Wireless Sensor Body Network (WSBN) with the MAWCS to capture upper body motions and voice commands. This network is essential for ARA command processing from user input. The paper develops and integrates modern sensor technologies including IMUs and electromyography sensors to accurately capture user motions and commands.

Result:



Forward Movement Using IMU   Right Movement Using IMU

Biography

Mr. S. S. Kiran serves as an Assistant Professor in the Department of Electronics and Communication Engineering (ECE) at Lendi Institute of Engineering and Technology. Concurrently, he is pursuing a Ph.D. at KL Deemed to be University, focusing on the field of GPS. His academic background includes a successful completion of an M.Tech program in VLSI Design. Mr. S S Kiran has made significant contributions to the academic and research community. He has authored over 30 research papers, which have been published in reputable journals and presented at prestigious conferences. In addition to his publications, he has also demonstrated his innovation and expertise by filing two patents. His research interests encompass a wide range of topics within the realm of Embedded Systems, including ARM-based controllers, IoT, Low Power VLSI design, Massive MIMO systems, GPS technology, and Robotics.

Coupled CFD-FEA simulation of bulging tube failure in hot temperature zone

Shweta Deshmukh and **Pradyumna Dhamangaonkar**

College of Engineering Pune Technological University, India

Bulging tube failure is common when tubes are exposed to high temperatures. The most prevalent reasons of bulging tube failure are more heating and creep deformation. This research article simulates the most typical causes of tube bulging failure. Coal-fired power station boiler tubes from diverse processing industries display identical bulging tube failures when loaded with pressured fluid and placed inside a higher temperature zone. The temperature variation between the outside and inner tube walls and compressed fluid inside the tube demonstrates efficient thermal expansion on the metal tube wall in the form of creep ductile deformation. This research reveals techniques based on the expansion of fluid and metal by merging traditional CFD and FEA models. The thermal-structural behavior of tube deformation can be predicted using a combined CFD-FEA simulation of tube bulging failure. The CFD modeling solves the increment in fluid pressure inside the metal tube and the increment in temperature inside and outside the metal tube. FEA modeling aims to solve the thermal and structural behavior due to radial deformation and thermal expansion caused by thermal loads. A coupled CFD-FEA simulation of swelling tube failure in a hotter and pressurized zone shows the creep ductile deformation of the tube wall, in which the possibilities of tube failure are greater.

Biography

Shweta Deshmukh is pursuing Ph.D. degree in Mechanical Engineering Department, College of Engineering Pune Technological University, Pune, Maharashtra, India. Now, she is Research Scholar at Mechanical Engineering Department, College of Engineering Pune Technological University, Pune, Maharashtra, Indi. Her current research interests include Power plant engineering, Metallurgy, Heat Transfer, boiler tube failures in high temperature zones.

Pradyumna Dhamangaonkar is a retired associate professor in Mechanical Engineering Department, College of Engineering Pune Technological University, Pune, Maharashtra, India. He received Ph.D. degree in mechanical engineering from S.P. Pune University, Pune, Maharashtra, India. His current research interests include boiler tube failures, Heat transfer, Heat Exchanger Design, Steam Technology and Energy Conservation.

Quality checking and improvement of material using fractal dimension estimation approach

Abadhan Ranganath

Koneru Lakshmaiah Education Foundation, India

The materials strength and the quality can be checked at microscopic level. The composite materials are heated up to a level then the surface is analyzed. So, the microscopic images can be captures and processed. The fractal dimension estimation is a benchmark technique for surface analysis. A low-quality material will show rough surface while heating. But good quality material can have more resistance and doesn't lose its property. Using FD technique, the surface roughness can be measured. The experiments have been carried and the results are obtained from image processing technique, it is observed that the material with a uniform composition shows rougher surface, but the result obtained with smoother surface have found in week composite.

Ni doped $Ni_{1-x}Co_xFe_2O_4$ (x=0, 0.5 and 1) nanocomposites for the fabrication of NH_3 gas sensor

Hariom Pawar[1,2] and **Deepshikha Rathore**[2]

[1]*Department of Physics, JECRC University Jaipur, India*
[2]*Amity School of Applied Sciences, Amity University Rajasthan, India*

Ni doped $Ni_{1-x}Co_xFe_2O_4$ (x=0, 0.5 and 1) nanocomposites has been synthesized using chemical co-precipitation method at low temperature. The structural, morphological, optical, and chemical properties have been investigated with corelating the theoretical framework. The cubic phase of synthesized nanocomposites has been confirmed for all sample. Spherical morphology of the nanocomposites has been investigated with scanning electron microscopy and the optical energy bang study has been done experimentally using DRS and theoretically by Quantum ESPRESSO software. Phase purity of the synthesized $Ni_{1-x}Co_xFe_2O_4$ (x=0, 0.5 and 1) nanocomposites has been achieved using Raman spectroscopy. The $Ni_{1-x}Co_xFe_2O_4$ nanocomposites at configuration x=0.5 has achieved remarkable achievement to detect NH3 gas at very low concentration. Operating temperature for $Ni_{1-x}Co_xFe_2O_4$ nanocomposites at configuration x=0.5 is found to be 90 OC to get maximum response of 83% which shows the novelty of this research.

Biography

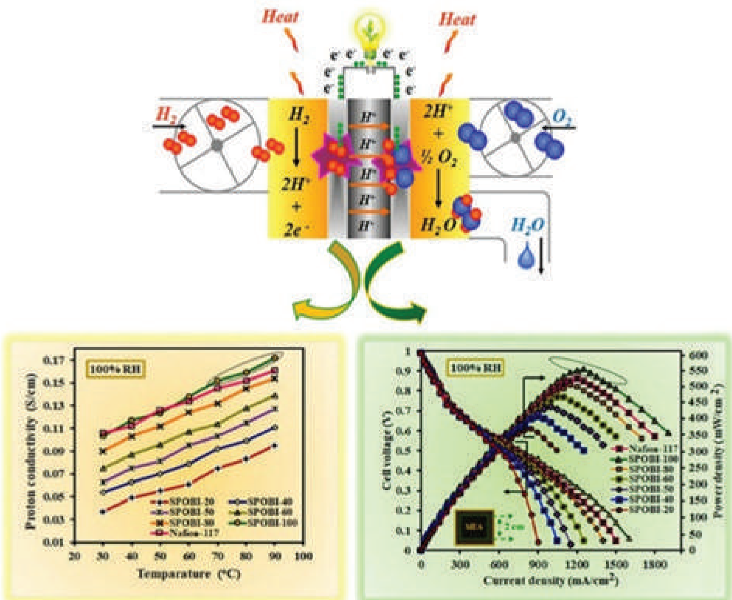
Dr. Hariom pawar has completed his BSc and MSc. Degree in Physics from Dr. Harisingh Gour Central University Sagar, Madhya Pradesh, India and doctorate degree in Physics from Amity University Rajasthan, Jaipur, Rajasthan, India in 2022. He has his expertise in development of composites materials at nanoscale, estimation, and passion in improving the physicochemical properties of ferrites bases nanocomposites. Recently, He has developed Materials Science Research lab in JECRC University under seed money grant to provide research atmosphere to graduate and post graduate students.

Novel sulfonated poly(oxybenzimidazole) membranes bearing sulfonapthalimide pendant groups with improved proton conductivity and fuel cell performance

Nagendra Prasad Cheluri and **Tharanikkarasu Kannan**

Department of Chemistry, Pondicherry University, India

The goal of the present work is to introduce a new aromatic bulky six-membered sulfo-napthalimide pendant groups, specifically 2-(2,5-dicarb-oxyphenyl-1,3-dioxo-2,3-didihydro-1Hbenzo[de]isoquino- line-6-sulfonate (PDDDBIS), into the poly(oxybenzimidazole) (POBI) main chain. As no sulfo-napthalimide-bearing POBI has been reported yet, this could be a potential strategy to improve the solubility, processability, and proton conductivity of sulfonated POBIs in addition to boosting fuel cell performance. Out of six membranes synthesized, one sulfonated POBI membrane with pendant PDDDBIS groups (SPOBI-100) exhibited a fairly high proton conductivity of 0.172 S/cm, which is higher than Nafion-117 (0.161 S/cm) at 90°C. Notably, an H_2/O_2 PEM fuel cell fabricated with the SPOBI-100 membrane displayed good performance with the maximum peak power density of 547 mW/cm2 and output current density of 1259 mA/cm^2 in 0.99 V at 90°C with100% RH, which is higher than the Nafion 117 power density (519 mW/cm^2) and current density (1215 mA/cm^2) under the same testing conditions.



Screening of pharmaceutical pollutants along with emerging contaminants in the sediments of the Periyar River, located in Kerala (India) by using High-resolution mass spectrometry (UPLC-Q-ToF-MS

Tintu Tomy and **J. Jameson**

Department of Botany, Research Centre, St. Albert's College, India

In this study, ultra-performance liquid chromatography coupled with quadruple time-of-flight mass spectrometry (UPLC-Q-ToF-MS) was utilized to conduct a comprehensive screening and identification of pharmaceutical pollutants and emerging contaminants (ECs) in the vicinity of Periyar River, specifically near Aster Medicity Hospital, the dumping yard of Amrutha Hospital, and the Vaduthala Bridge regions located in Kerala, India. To enhance the sensitivity and scope of the analysis, both positive and negative ionization modes were employed, utilizing electrospray ionization (ESI) technology. The initial sediment sample preparation followed the QuEChERS method. Among the numerous contaminants detected, a total of twenty-five ECs were identified, with four of these compounds being classified as pharmaceutical pollutants. This study holds significant importance as it represents the first extensive investigation into pharmaceutical pollutants within these hospital-adjacent regions. This highlights the pressing need for further analysis and a deeper understanding of the environmental situation at hand. The presence of these ECs necessitates immediate attention due to the irreversible damage they can cause to the riverine ecosystem, primarily through the degradation of water quality resulting from both industrial and domestic discharges. The primary objective of this study is to assess the potential environmental impacts, ecosystem effects, and potential health implications in a densely populated region. A key focus of this research is the utilization of high-resolution mass spectrometry through the UPLC-Q-ToF-MS technique for the screening and detection of pharmaceutical pollutants. This advanced analytical method enables rapid, high-resolution separations with exceptional sensitivity. The Periyar River receives industrial and municipal wastewater discharge, significantly impacting its water quality. To assess this, water quality was analyzed using guidelines from the American Public Health Association (APHA) in 1976 and Trivedi and Goel's criteria from 1986.

Biography

Academic Details:

Research Scholar at the Department of Botany, Research Centre, St. Albert's College, Ernakulum, Kerala, India.

Affiliated with Mahatma Gandhi University, Kottayam, Kerala.

Career Highlights:

Commenced career as a Research Scholar in January 2018, specializing in Botany with a significant focus on environmental studies.

Presented three research papers at international seminars hosted by St. Albert's College.

Undertook a four-month internship as part of the Ph.D. program at Cochin University of Science and Technology, sponsored by the Directorate of Collegiate Education, Government of Kerala, under the Aspire Scholarship Program for 2018–19.

Awarded the Junior Research Fellowship, sponsored by Mahatma Gandhi University, Kottayam, to support research work.

Phase transformations via annealing and improved Photocatalytic and antibacterial activities of ZnSe- ZnO nanostructures

Rekha Garg Solanki and **Prerna Gupta**

Department of Physics, Dr. Hari Singh Gour Vishwavidyalaya, India

Heterogeneous photocatalysis is a promising technology for eradicating organic, and microbial pollutants from waste and contaminated water. It is a more preferable method to the conventional wastewater treatment approaches on account of low cost, environmental benignity, ability to proceed at room temperature and pressure conditions, and high capability of degrading pollutants and release environment safe products with the use of sun light. ZnSe and ZnO NSs are such hetrogeneous catalysts. The present work ZnSe-ZnO NSs were successfully synthesized via co-precipitation method, annealed at 300°C and 400°C and predicted phase transformation of as-prepared ZnSe-ZnO NSs. The samples were characterized for structural, morphological, optical properties and then applied for photo-degradation of orgainc Methylene Orange (MO) dye and antibacterial analysis against gram positive Bacillus cereus bacteria. The structural analysis confirmed the formation of hexagonal phase for ZnSe-ZnO NSs. The growth of NSs (NRs and NPs) were demonstrated by TEM micrographs. EDX analysis confirmed the presence of constituent elements. The annealing transforms co-existed ZnSe-ZnO NSs into pure ZnSe NRs and ZnO NSs. The photo-catalytic and anti-microbial analysis performed for annealed samples; the results showed that pure ZnSe NRs (at 300 C) are found more efficient photo-catalyst for degradation of methylene orange (MO) dye in comparison to ZnSe-ZnO NSs. In addition, the antibacterial activity of annealed samples studied by agar well diffusion method and the highest antibacterial activity was observed for pure ZnSe NRs. In conclusion, the annealing transformed phases of as-prepared sample as pure ZnSe NRs and ZnO NSs. Both the samples found effective photo-catalysts for the treatment of industrial wastewater for removing synthetic dyes and other toxicants in UV light and effective antimicrobial agents for suppressing Bacillus cereus bacteria. ZnSe NRs shows comparatively best catalytic and antimicrobial results than ZnO NSs.

Biography

Dr. Solanki did M.Sc.(Physics) at Guru Ghasidas University, Bilaspur (CG) in 2003. She then joined the research group of Prof. P Rajaram at Jiwaji University Gwalior (MP). She received her M.Phil degree in 2005 and PhD in 2018 from the same institution. She obtained the position of an Assistant Professor at the Dr Hari Singh Gour University, sagar (MP) in 2007. presently, She is an associate professor in the same institute. She has published many research articles, book chapters and delivered 35 talks, presented 20 papers in conferences and seminars. She has also published a book of poetry collections “Unke liye”.

The potential applications of two azine-decorated d10-MOFs in corrosion inhibition for mild steel surfaces exposed to a saline environment: A comprehensive exploration through both experimental and theoretical approach

Sukdeb Mandal[1,2] and **Priyabrata Banerjee**[1,2]

[1]CSIR-Central Mechanical Engineering Research Institute, India
[2] Academy of Scientific and Innovative Research (AcSIR), India

Recently, the use of metal-organic frameworks (MOFs) as an efficient corrosion inhibitor has been focused on due to their unique excellent properties such as being rich in π-electron system, chemical and thermal robustness and supramolecular task specific functionality etc. The present work demonstrates the judicious synthesis of two d10-MOFs namely CI@Cd-MOF and CI@Zn-MOF utilising organic struts like 4,4′-oxybisbenzoic acid (OBA) and (1E,2E)-1,2-bis(1-(pyridine-4-yl)ethylidene)hydrazine (BPD) and investigated as efficient inhibitor for mild steel corrosion in an adverse corrosive medium i.e. in 3.5 wt% saline medium. The application of MOFs as heterogenous inhibitor for mild steel corrosion in saline medium has been assessed via Potentiodynamic polarisation (PDP) and electrochemical impedance spectroscopy (EIS) studies. The EIS analysis shows that the effectiveness of corrosion inhibition rises with increasing inhibitor concentrations, reaching 90.15 % with the application of 50 ppm of CI@Zn-MOF.

Biography

His research primarily revolves around the exploration and development of novel organic and metal-organic functional materials, with a specific focus on their potential applications as corrosion inhibitor as well as advanced lubricant additives. He was dedicated to advancing the field by creating cost-effective, environmentally friendly, biologically benign, and highly efficient inhibitor and additives. Over the past few years, his research efforts have resulted in numerous publications in reputable scientific journals, all centered on the creation of lubricant additives derived from organic and biomaterial sources. Additionally, he has conducted extensive investigations into the impact of varying alkyl chain lengths on the performance of these lubricant additives. Furthermore, his research has delved into the utilization of theoretical approaches such as density functional theory and molecular dynamics simulations to tackle complex lubrication-related challenges. These multifaceted efforts collectively contribute to the ongoing evolution of lubrication technology.

Nanotechnology revolutionizing agriculture: From nano fertilizers to eco-friendly solutions and agrochemical remediation

Tamanna Kumari[1], **Deepak Phogat**[2] and **Vineeta Shukla**[1]

[1]*Department of Zoology, Maharshi Dayanand University, India*
[2]*Department of Environment Science, Maharshi Dayanand University, India*

For numerous decades, farmers have reaped the advantages of employing fertilizers within the realm of agriculture. Traditional fertilizers have incurred substantial costs and posed detrimental consequences on both the environment and human health. Nano-scale fertilizers present themselves as a financially efficient substitute for conventional chemical fertilizers, holding the potential to steadily amplify global food production. Nano fertilizers exhibit the capacity to function as nutrient carriers due to their composition comprising macronutrients and micronutrients. In addition to providing delayed nutrient release, these nano-carriers facilitate precise nutrient transport within the plant, thereby reducing the overall quantity of active compounds required for deposition. Furthermore, the amalgamation of nano-fertilizers with microorganisms, termed nano biofertilizers, offers multifarious benefits, thereby forging a novel and imperative trajectory towards sustainable agriculture. The utilization of traditional fertilizers is anticipated to decrease by 50% owing to the adoption of eco-friendly alternatives. Nano-coated materials characterized by a dimension exclusion limit exceeding 10 nanometers can permeate the stomata, although it is noteworthy that nanoparticles may also create breaches and infiltrate the plant's vascular system. This comprehensive review delineates the production, environmental dispersal, operational mechanisms, and interactions of nanomaterials with soil, as well as the potential advantages they confer upon agriculture. Such elucidation provides the foundational knowledge required for policymaking and regulation, particularly in light of the detrimental impacts of agrochemicals on soil fauna, which are pivotal for preserving soil health. The phenomenon of biomagnification stemming from agrochemicals engenders a rapid decline in biodiversity, with their most frequent utilization occurring in fruit cultivation and post-harvest treatments. Consequently, this calls for substantial investments in research aimed at remediating contaminated environments and safeguarding human health. Leveraging nanotechnology, this study endeavors to address knowledge gaps and delineate the future prospects of agrochemical remediation.

Biography

Dr. Tamanna Kumari, born on January 27, 1995, in the picturesque landscapes of Haryana, India, is a luminary in the field of zoology. Her journey from the heartlands of Haryana to earning a PhD in Zoology is a testament to her unwavering dedication and passion for the natural world.

From a young age, Tamanna displayed an insatiable curiosity about the rich biodiversity that surrounded her. This innate fascination led her to pursue a Bachelor's degree in Biology, setting the stage for her illustrious career.

After completing her undergraduate studies, Tamanna embarked on an academic odyssey that culminated in a PhD in Zoology. Her groundbreaking research has deepened our understanding of animal behavior and ecology, earning her accolades within the scientific community.

Beyond her academic pursuits, Dr. Tamanna Kumari is a fervent advocate for wildlife conservation, embodying the spirit of Haryana's commitment to environmental stewardship. Her remarkable journey serves as an inspiration, demonstrating how one individual's passion can leave an indelible mark on the world of zoology and conservation. Born in Haryana, she carries the spirit of her homeland's vibrant culture and is a shining example of how one individual's passion and determination can make a profound impact on our understanding of the animal kingdom and the imperative to protect it.

Investigation and analysis of defects of rotational moulded polyethylene fuel tanks for production enhancement

Vilas Umbare

Department of Mechanical Engineering, G. H. Raisoni College of Engineering and Management, (SPPU), India

Rotational moulding is a viable alternative to other plastic processing techniques as it allows manufacturers the ability to produce stress-free goods economically. Most rotomoulding products are manufactured from linear low-density polyethylene (LLDPE) as a base resin from the distinct polyethylene, generally thermoplastics are preferred from which 80% of polyethylene is widely favored.

In present study the critical defects in rotational moulded fuel tank were studied and minimized which are difficult to identify visually to reduce the cost and time associated with the process. A defect study was conducted over a period of 7 months, selected 7 critical defects out of top 25 for further analysis and reduction which are critical and needs destructive testing to find out. Quality Function Deployment (QFD) is used for rotational moulding process optimization and control by collecting Voice of the Customer (VOC) to Functional requirements and finally production requirements and control. By employing Taguchi method, the mechanical properties of LLDPE, including tensile strength, flexural strength, and creep resistance, are evaluated to enhance fuel tank quality and performance. The optimum process parameters obtained from the Design of Experiments were, 195°C for Peak Internal Air Temperature (PIAT), 5 mm wall thickness and an Oven Residence Time (ORT) of 25 min.

The tensile and flexural strength were carried out at three different operating temperatures considering the tank will be subjected to variable operating conditions in real world exercise. All the mechanical properties such as Tensile strength, Tensile Modulus, Flexural strength and Flexural modulus were observed to be highest for 195°C PIAT value and hence the Fuel Tanks made at 195°C PIAT has been used for metallurgical testing. The tensile strength and tensile modulus were performed for three different operating temperatures 23, 60 and 80°C. The test samples at 23°C were observed as 19.35 MPa which reduces to 15.17 MPa at 60º C. For 80º C, the sample was found to have an average tensile strength of 10.46 MPa. The maximum percentage of elongation was observed at 80°C with an average value of 131.76 % that of the original dimension followed by 89.58% and 54.16 % elongation at 60°C and 23°C. For the 23ºC operating temperature, the average value of the flexural strength is 75.97 MPa which decreases to 58.64 MPa and 57.87 MPa with the increase in operating temperature to 60ºC and 80ºC respectively.

In the next stage the experimental analysis was performed for bulge behavior, burst behavior, creep behavior and fatigue behavior. The tank sample with PIAT value 180°C and 190°C fails to fulfill the acceptance criteria, only tank with PIAT value 195°C fulfill the acceptance criteria for creep test, temporary deformation and permanent deformation. After taking the corrective measures and implementing process improvements data taken for next 7 months the % of major defects were significantly reduced by 44 % to 69 %. The findings of this study have created an opportunity for manufacturers to utilize the knowledge gained, by using process optimization as a guiding principle to navigate through the complexities of defect reduction and achieve both increased profitability, reduction in development time, Quality, customer satisfaction and finally production enhancement.

Biography

Vilas Umbare is a Ph.D. student and received approval for pre-Synopsis, currently studying in the mechanical engineering department in Savitribai Phule Pune University, India. He has also 20+ years of in-depth mechanical engineering experience in product design and currently working at John Deere India Pvt. Limited from last 16 years and worked in the USA for 4 years. His current research interest includes Rotational moulding and process optimization for production enhancement.

Vapour polishing of fused deposition modelling (FDM) parts

Vincent Herald Wilson D

Vellore Institute of Technology, India

Fused deposition modelling (FDM) is a popular additive manufacturing technology that is used to create 3D objects. However, FDM parts often have a poor surface finish, which can limit their functionality and aesthetics. Vapour polishing is a post-processing technique that can be used to improve the surface finish of FDM parts. The techniques are reviewed in terms of their effectiveness, efficiency, and impact on the mechanical properties of FDM parts. The paper also discusses the factors that affect the performance of vapour polishing, such as the type of material, the process parameters, and the post-treatment. The paper concludes by providing recommendations for the use of vapour polishing to improve the surface finish of FDM parts.

Vapour polishing techniques: There are two main types of vapour polishing techniques: cold vapour polishing and hot vapour polishing. Cold vapour polishing is performed by exposing the FDM part to a vapour of a solvent, such as acetone, at room temperature. Hot vapour polishing is performed by exposing the FDM part to a vapour of a solvent at a higher temperature.

Effectiveness of vapour polishing: Vapour polishing has been shown to be effective in improving the surface finish of FDM parts. The degree of improvement depends on the type of vapour polishing technique, the solvent used, and the process parameters.

Impact on mechanical properties: Vapour polishing can have a small impact on the mechanical properties of FDM parts. The impact is typically more pronounced for hot vapour polishing than for cold vapour polishing.

Factors affecting vapour polishing: The effectiveness of vapour polishing is affected by a number of factors, including the type of material, the process parameters, and the post-treatment. The type of material has the greatest impact on the effectiveness of vapour polishing. Some materials, such as ABS, are more easily polished than others.

Biography

Dr. Vincent Herald Wilson is a highly accomplished engineer and educator with over 37 years of experience in the field of Mechanical Engineering. He holds a PhD in Mechanical Engineering from the National Institute of Technology, Tiruchirappalli, India. His research interests include IC engines, solar energy, renewable energy, desalination, and circular economy. Dr. Wilson has published over 30 papers in peer-reviewed journals and conferences.

Dr. Wilson is currently a Professor at the Department of Mechanical Engineering, Vellore Institute of Technology (Deemed University), Vellore an Institute of Eminence conferred by the government of India.

In addition to his teaching and research, Dr. Wilson is also actively involved in outreach activities. He has organized several workshops and seminars on in technical themes and personality development to students and the public.

He has to his credit 7 patents granted by the Government of India, He has a startup and involved in product development.

Magnetic Tunnel Junction (MTJ) for energy efficient nonvolatile memory applications

Prasanna Kumar Misra

Indian Institute of Information Technology, India

Recently Magnetic Tunnel Junction (MTJ) along with MOSFETs has promised to deliver high performing nonvolatile memory. These devices are made of ferromagnetic layers and an insulating layer. The two ferromagnetic layers that are important elements of MTJs are commonly comprised of cobalt-iron (CoFe) or nickel-iron (NiFe). These layers are typically separated by a thin insulating layer and are used to store magnetic information. The frequently used Insulating Layer is Aluminum oxide (Al2O3) or magnesium oxide (MgO). When the magnetic orientations of the two ferromagnetic layers are parallel, electrons can quantum mechanically "tunnel" through this layer, and this phenomenon can be explanined through the tunneling magnetoresistance. A structure of CoFeB/MgO PMA MTJ exhibit best switching performance and tunnel magneto resistance ratio. To improve the effectiveness and functioning of MTJs for emerging applications, researchers and engineers are putting efforts to investigate new materials and structures.

Magnetic Tunnel Junctions (MTJs) are frequently used in non-volatile memory devices known as Magnetic Random-Access Memory (MRAM) due to faster read, write operation, improved endurance while consuming low power. The Parallel state of device is detected as 0 and Antiparallel state is detected by 1. Data is stored utilizing the magnetic orientation of the ferromagnetic layers of MTJs in a type of computer memory known as MRAM. Each memory cell in MRAM is made up of one or more MTJs. These MTJs function as switches and can be in either the parallel or antiparallel stable magnetic states. Binary data (0 and 1) are represented by these states. For read operation, a read current is sent through the MTJ in order to read data from an MRAM cell. The relative alignment of the magnetic moments in the ferromagnetic layers affects the MTJ's resistance. The data stored in the memory cell can be read as a result of this change in resistance being recognized as a voltage or current difference. For write operation, a magnetic field and a write current is provided in order to write data to an MRAM cell. The magnetic orientation of one of the ferromagnetic layers can be altered by this current and magnetic field combination, turning the MTJ into the desired state (parallel or antiparallel) to store the new data. An MTJ behaves like a resistor whose values can be determined by parameters of MTJ. MRAM doesn't loose information when the power is switched off. This is due to the MTJs' magnetic states, which are stable and do not need to be continuously powered. These memories have wide range of applications like Storage-class memory in computers, embedded memory in microcontrollers and system-on- chip (SoC) devices.

Biography

Dr. Prasanna Kumar Misra obtained BTech (2005) and PhD (2014) from National Institute of Science and Technology, Berhampur and IIT Kanpur respectively. Since 2014. She was working as a faculty member in the department of Electronics and Communication Engineering at IIIT Allahabad. His specific areas of interests are Semiconductor Devices, Integrated Circuits and Systems.

Design and modelling of Thin Film Bulk Acoustic Resonator (FBAR) for RF application

Meghana A. Hasamnis

Shri Ramdeobaba College of Engineering and Management, India

Thin film bulk acoustic resonator (FBAR) is widely utilized as an RF filter (Q) in order to achieve minimal in-band losses and high Quality Factor in complex 5G wireless communication systems. This paper describes the basic notion of FBAR on top of a cavity device design for building an RF-filter. The top and bottom electrodes are made of aluminium (Al), the piezoelectric materials used are zinc oxide (ZnO) and barium titanate (BaTiO3), and the substrate is silicon (Si). The BaTiO3-based resonators can function better at high temperatures because BaTiO3 has the highest thermal stability of any piezoelectric material whereas ZnO is mostly used to build sensors and actuators due to lower flaws and MEMS compatibility. Also, the resonator attains remarkable Quality factors of 1895 and 1780 for ZnO and BaTiO3 at5.6 GHz, respectively. A lower rate of energy loss is indicated by a higher quality factor.

Biography

Dr. Meghana A. Hasamnis, Professor in Electronics Engineering Department has completed her M. Tech. in Electronics Engineering from VNIT, Nagpur and Ph. D. from RTMNU, Nagpur. She has 20 years of teaching experience.

She has published more than 25 research papers in various peer reviewed journals and conferences. Her 04 patents are granted. She has 03 Book chapters to her credit. She is member of professional organization ISTE. She is registered Ph.D. supervisor of R.T.M. Nagpur University.

Thermally compensated ZnO film bulk acoustic resonator for RF application above 5GHZ frequency

Poorvi k Joshi

Shri Ramdeobaba College of Engineering and Management, India

We present a study of the effect of introducing two-series air gap capacitor and tailoring the oxide in thin-film bulk acoustic resonator (FBARs) for thermal compensation at a frequency > 5 GHz. This approach reduces the temperature coefficient of frequency value of ZnO FBAR upto 0.011 ppm/◦ C within the industrial temperature range at 5.45 GHz frequency. The quality factor of the compensated FBARs is 1100 with a motional impedance of 38 Ω. This exceeds significantly the quality factor of uncompensated FBARs (□120). Additionally, we report on the stress and strain required to obtain an optimal design of compensated FBARs.

Biography

Poorvi Joshi completed B.E. degree in Electronics and Telecommunication from the Nagpur University, Nagpur, Maharashtra, India in 2003, M.Tech. in VLSI Design from the RCOEM, RTMNU Nagpur, Maharashtra, India in 2009 and Pursuing PhD in the field of MEMS since May 2019.She is working as an Assistant Professor in RCOEM, Nagpur from 2006. Her current research interests include MEMS Resonator, Reliability. Poorvi Joshi is a Fellow of IETE, ISTE, IEEE.

Comparative studies of Linear and nonlinear rheological behaviour of Microfibrillated Cellulose and Xanthan Gum suspensions

Suresh Kumar Yatirajula[1], Vishal Kumar[1] and **Jagadeeshwar Kodavaty[2]**

[1]Department of Chemical Engineering, Indian Institute of Technology (Indian School of Mines), India
[2]Department of Chemical Engineering, University of Petroleum and Energy Studies, India

Microfibrillated Cellulose (MFC) and Xanthan Gum (XG) are a new class of novel material extracted from agricultural residues and plants through various techniques such high pressure homogenization, ultra-sonication, crushing, grinding, chemical treatment and possessing multifaceted properties such as large surface area, high aspect ratio, mechanical robustness, biodegradability, biocompatibility, complex rheology has drawn a lot of attention in last decade.

Objectives: The present work is comparative studies of rheological behaviour of Microfibrillated Cellulose and Xanthan Gum suspensions with systematically changing experimental conditions such as concentration, salt content, and temperature and aging time.

Scope: It's quite interesting to observe that Microfibrillated Cellulose and Xanthan gum suspension are exhibits an extreme pseudoplastic behaviour and viscoelastic properties even at very low concentrations also.

Methods used: The experiments were carried out in the modular compact rheometer of Anton Paar (MCR 102). Rheological properties of Microfibrillated Cellulose and Xanthan Gum suspensions in both linear and nonlinear regions have been investigated by means of techniques, small amplitude oscillatory shear (SAOS) and large amplitude oscillatory shear (LAOS) respectively.

Results & Discussions: Both the systems overall under the varying shear rates range of 0.01s-1-1000 s-1, resulting in shear thinning behaviour as reported in Table 1, but MFC by a build-up of a network of hydroxyl groups present on the surface, resulting in dilatant behavior transitional shear range (10 s-1-40 s-1) and apparent viscosity does not have any significant effect on the MFC, but on Xanthan Gum varying temperature from 25ºC- 60ºC. MFC and XG displayed linear viscoelastic behavior in the range of 0.07% and 10 % of strain amplitude with constant frequency respectively as shown in Figure 1.

Conclusion: Microfibrillated Cellulose loss and storage modulus, within linear viscoelastic range, were confirmed to be higher than the conventional base Xanthan Gum. The higher value of storage modulus indicated the high degree of cross-linking of fibrils. Storage modulus was observed to be independent of frequency by performing frequency sweep measurements on both systems. LAOS test protocols and the associated materials measure to provide a rheological figure print of the yielding behavior of a Microfibrillated Cellulose and Xanthan Gum suspensions (with Lissajous curves) that can be closely represented within the domain of a Pipkin diagram defined by the amplitude and angular frequency.

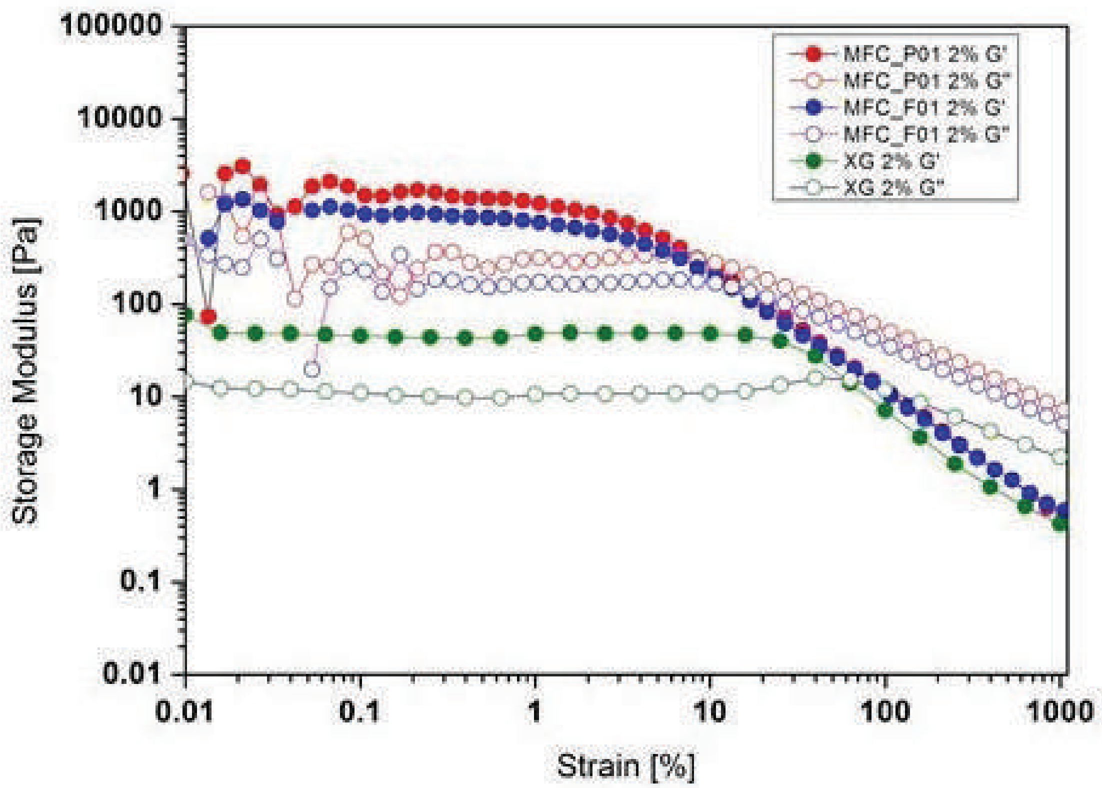


Figure.1.

Shear Rate [1/s]	Viscosity [Pa.s]	
	MFC 2.0 wt%	XG 2.0 wt%
0.001	113000	185
0.01	92100	597
0.1	12500	81.8
1	6610	11.4
10	450	1.9
100	12	0.255
1000	0.121	0.046

Table.1.

Biography

Suresh Kumar Yatirajula am working as an Assistant Professor in the Department of Chemical Engineering, Indian Institute of Technology (Indian School of Mines) Dhanbad- Jharkhand, India. Dr Yatirajula works extensively on the rheology of complex fluids and flow through porous media. His group has established an excellent research facility to conduct research on chemical flooding EOR and the rheology of EOR polymers, surfactants, and Microfibrillated Cellulose & and published a couple of journals in these areas. He has presented several papers at International conferences including the 9th World Congress of Chemical Engineering (WCCE9) Seoul, South Korea, and the International Conference on Rheology and Fluid Mechanics, Alicante, Spain.

Investigation into burnishing process to examine effect on surface integrity, wear and corrosion resistance of carbon alloy (EN31) steel

Nitin Jalindar Varpe

Amrutvahini College of Engineering, India

Residual stress and surface finish are prominent members responsible for service attributes of component, like wear resistance, corrosion resistance and fatigue life. This leads to investigate ball burnishing as a supplementary process to enhance durability of component. Burnishing is a well-known, inexpensive yet powerful super finishing process that includes plastic deformation of surface layer resulting in cold working which improves mechanical properties and extend components operational life. The aim of current examination is to investigate and optimize ball burnishing process by Taguchi integrated PCA technique for finding most feasible combination of process variables to decrease specific wear rate and increase corrosion resistance of EN31 steel components. Post-burnishing, hardness improved from 178.5 to 265 Hv and roughness of surface reduced from 0.439 to 0.091 μm. The optimization findings revealed that 52% improvement in wear resistance as compared to the turned surface. X-ray diffraction shows that compressive residual stress was induced exactly under the burnished surface. The observed polarization curves and surface micrographs demonstrate that corrosion resistance is improved and consistent. The results confirm that ball burnishing technique enhanced the functional properties of EN31 steel.

Biography

Nitin Jalinadr Varpe received the bachelor's degree in production engineering from Pune University in 2012, the master's degree in production engineering with specialization in CAD/CAM from Pune University in 2015, and the doctorate of philosophy (Ph.D.) degree in Mechanical Engineering from University of Engineering and Management, Jaipur in 2023. He is currently working as an Assistant Professor and Assistant Workshop Superintendent at the Department of Automation and Robotics Engineering, Amrutvahini College of Engineering, Sangamner. His research areas include manufacturing process optimization and CAM.

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Design and simulate an energy harvesting device for powering the pacemaker using COMSOL

Surya Prakash[1], **Anurekha Sharma**[2] and **Sunny**[1]

[1]*IIIT Allahabad, India*
[2]*Kurukshetra University, India*

The pacemaker is an essential device for the heart patient. Current pacemakers are micro-battery operated that have limited life span. The aim of this research is to make the pacemaker for long lasting and independent on the micro-battery power. This research is focus to design an energy harvesting mechanism for the leadless implantable miniaturized pacemaker. The heart beat vibration uses as an energy harvesting using piezoelectric material for a particular frequency spectrum which is 20 Hz to 25 Hz. This research explains about the dimensions, shape and its restriction for the optimized power generation in the range of micro watts. The material use for the device design are biocompatible. It consists of a flexible material base cantilever of Polydimethylsiloxane (PDMS) with the proof mass to increase the movement of the cantilever due to the heart vibration. Another cantilever of piezoelectric material of Aluminum Nitride (AlN) implant over the base cantilever to generate the voltage whenever there is a deformation (contraction and expansion) in the crystal orientation of the material. The proposed design resonates at 22.90 Hz with the displacement of 542 μm. The generated stress is 43.80 MPa and corresponding generated voltage is 2.5 V which is sufficient to generate 0.41 μW power. The design is presented in the Fig. 1.

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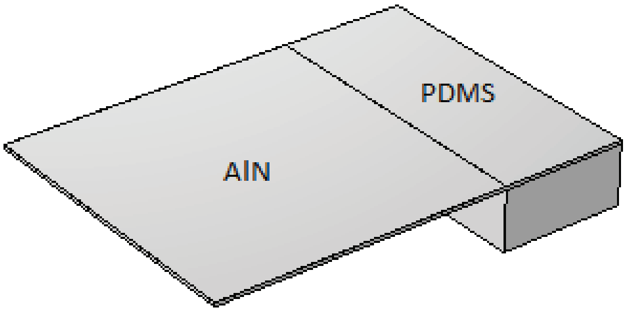

Fig. 1: The proposed design for the energy harvesting device for powering the pacemaker

Biography

Dr. Surya Prakash is an Assistant Professor in the Department of Electronics and Communication at the Indian Institute of Information Technology Allahabad. He received his Master and Doctorate degree from the Department of Electrical Engineering, Indian Institute of Technology Bombay, India, in 2019. Dr. Surya Prakash has in-depth experience in MEMS device simulation and modeling and has published a good amount of publications in this area. He worked with different researchers and supervised many students in this research area. He has pioneered research on MEMS and Smart Embedded Systems and published more than 30 research articles over it.

Additive manufacturing of FeTi alloy through *in-situ* alloying via laser powder bed fusion using recycled SS316L and Ti6Al4V powders

Ashish Kumar Mishra and **Arvind Kumar**

Indian Institute of Technology Kanpur, India

Fe-Ti alloys are widely explored for potential high strength applications. These materials were also investigated for hydrogen storage following their excellent hydrogen absorption-desorption properties [1]. Due to the difficulties faced during their manufacturing via conventional routes, laser additive manufacturing is explored as a potential technique due to the very large cooling rates involved [2]. It was, however, observed that manufacturing these alloys via laser additive manufacturing is costly and the material becomes highly crack-prone [3]. To reduce the cost and improve the manufacturing quality, in this study it is proposed to use recycled SS316L and Ti6Al4V powders, which are frequently used in additive manufacturing of components for various industries and thus produce large quantities of used powder which need to be discarded after a few cycles of usage. Using these recycled materials, the costs can be brought down, and since the used powders are generally rich in the base material, higher FeTi content in the manufactured material can be obtained. To obtain the optimized process parameters for laser powder bed fusion additive manufacturing, laser power and scan speed were varied from 55-100 W and 100-1000 mm/s. The results showed that only a small parameter window of 75-80 W and 600-700 mm/s is optimal for highest density. Next, metallurgical characterizations were conducted on the polished samples to estimate the porosity characteristics, intermetallic phase formations and microstructure. Mechanical properties were also characterized for the optimized process parameters via conducting tensile and compression tests. These results are yet to be processed.

Biography

Mr. Ashish Kumar Mishra is a doctoral student in the Department of Mechanical Engineering, Indian Institute of Technology Kanpur, India. His primary interest is in investigating the laser powder bed fusion processing of Ti6Al4V and AlSi10Mg for which he has used both computational and experimental approaches. In addition, he also works around metallic lattice structures, investigating their compressive performance under various conditions.

Strength studies on concrete containing of recycled coarse aggregate and granite cutting waste as partial replacement of fine aggregate

Kuldeep Singh Kulhar

Vivekananda Global University, India

Recycled coarse aggregates and natural coarse aggregates have characteristic structures, such as porosity, water absorption, low surface density, and crush value, approving to the studies presented. Selecting suitable raw materials based on concrete's particular show standards, later designing cost-effective, high-quality concrete utilizing mixed proportion methods, is the utmost method to overcome the limitations of design methods, and this presents fresh concepts and design methods. The recycled coarse aggregates and natural coarse aggregate surround characteristics, including porosity, water absorption, low surface density, and greater crush value per the research studies. This research works investigates the compressive strength, split tensile strength, and flexural strength of concrete specimens. The natural coarse aggregates have been substituted with 0 percent, 20 percent, 40 percent, 60 percent, 80 percent, and 100 percent by a recycled coarse aggregate of construction & demolition waste of 30-years-oldbuilding and fine aggregate has been substituted with 40 percent of granite cutting waste. In this research work, the strength of the recycled coarse aggregates and granite cutting waste concrete was calculated. This research work presents the associate of the outcomes of the recycled coarse aggregates and granite cutting waste base concrete with the physical and mechanical properties of concrete.

Biography

Prof. (Dr.) Kuldeep Singh Kulhar has his expertise in evaluation of Soil Fiber Reinforcement and Rut Resistant Bituminous Mixes for Heavily Trafficked Road Stretches. Apart from this he is passionate for sustainability of construction materials by utilization of waste products or materials as well as recycling of materials. He is also concerned about Environmental Geotechnical Engineering for pollution free soil, water and air. He has also authored two books titled as "Soil Fiber Reinforcement" and "Stone Matrix Asphalt – SMA – Design & Construction".

Water drop-mediated triboelectric nanogenerator employing microporous polymeric film, using single-step microwave irradiation

Namrata Das and **Partha Pratim Ray**

Department of Physics, Jadavpur University, India

The escalating global energy crisis demands the harnessing of energy from clean and renewable sources like light, heat, wind, water and other vibrations in our surroundings. Water provides abundant mechanical energy sources including ocean waves, rainwater, tides and waterfalls, which offer inexhaustible supply of energy and could be an alternative to conventional energy sources. Typical hydropower stations can only work for water flowing with high velocity and are incapable of harvesting small-scale water flow. To address this, researchers are exploring new methods to harvest energy from water drops or small amount of water. Triboelectric nanogenerator (TENG) offers a sustainable solution by converting mechanical energy from water drops into electrical energy and thereby powering up small electronic devices. When two materials with different triboelectric polarities come into periodic contact and separation, they create electric potential differences. This drives the flow of electrons through an external load, enabling the generation of electrical output. Herein, we report a contact electrification mediated, water drop-driven TENG using PDMS nanocomposite and silk as the two triboelectric layers. The polymeric nanocomposite was integrated with flower-like CuS nanoparticles and was uniquely fabricated through a single-step baking technique using microwave irradiation, resulting in the formation of micropores within the composite film. TENG demonstrated an impressive voltage of 172 V and effectively illuminated 86 blue LEDs with a simple hand-imparted force. Exceptional sensitivity of 34.4 V/kPa allowed the device to efficiently harvest mechanical energy from water drops. Notably, when exposed to water splash from different heights, the TENG produced varying output voltages that possibly make it suitable to be used as a velocity sensor and can harness energy from randomly falling raindrops. Hence, this work introduces a simple and efficient method for harvesting energy from water drops that offers a straightforward approach for small-scale energy harvesting and sensing applications.

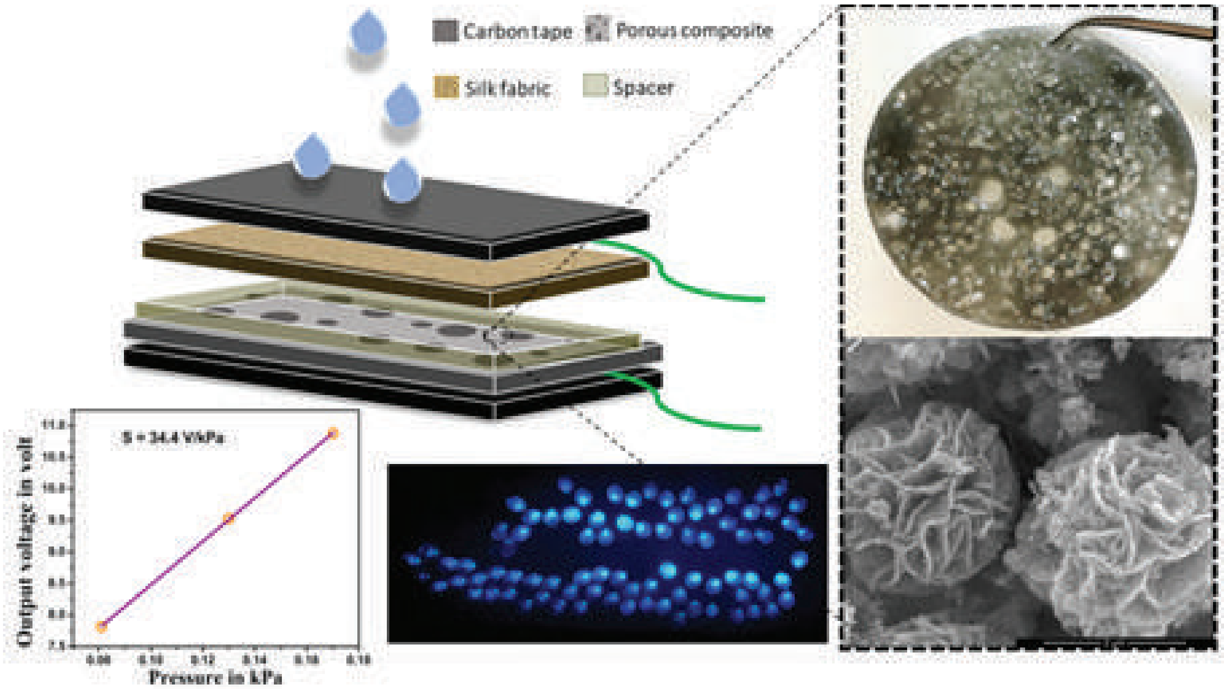

Figure: *Schematic diagram of the layered TENG showing porous composite film, flower-like formation of CuS nanoparticle, high sensitivity illumination of 86 blue LEDs under a periodic force by hand.*

Biography

Namrata Das is currently a senior research scholar at the Department of Physics, Jadavpur University, India. She has completed her Bachelor's degree and Master's degree in 2016 and 2018 respectively, in Physics from Jadavpur University as well. Her current research focuses on the fabrication of electroactive polymer composites, their various characterization techniques and their application in green energy harvesting domain such as piezoelectric nanogenerators and self-powered sensors. She has also been investigating various applications of triboelectric nanogenerators and body-attachable sensors in green energy harvesting, self-powered sensor domains and biomedical fields. She is also working on the development of piezoelectric Ultrasound Transducer and photoacoustic sensor using highly piezoelectric thin film for biomedical imaging. Her research also focuses on the usability of several bio-degradable nanocomposite thin films for the removal of several toxic dyes from wastewater by using the piezo catalytic technique.

VIRTUAL EVENT

6th Edition of

Advanced Materials Science World Congress

March 21-22, 2024

Piezo-tribo effects coupled, arch-shaped triboelectric nanogenerator for scavenging biomechanical energy and sensing low scale energy

Debmalya Sarkar and **Sukhen Das**

Department of Physics, Jadavpur University, India

With the rapid growth of internet of things (IoT), the portable and autonomous electronic devices are drawing immense attention among the researchers and human being due to their user friendly behavior and extensive applications in the field of human-machine interaction and health care unit. Among different type of electronic devices, triboelctric nanogenerator (TENG) is newly developed energy harvesting device that can easily transform mechanical energy into electrical energy. Herein, a self-powered and wearable triboelectric nanogenerator (PBTNG) is designed by using nanoporous bismuth selenide (Bi_2Se_3) incorporated PVDF composite piezoelectric thin film (PBi). The working mechanism of the PBTNG device depends on the piezo-tribo coupling effect. Furthermore, the porosity content of Bi_2Se_3 has been calculated from BET analysis and also described by basal spacing, which further helps in increment of β-crystalline phase of the thin film. Along with this, the density functional theory (DFT) has been performed to find out the electrical band gap and density of states of nanoparticles. The interaction of nanoparticle with PVDF and electrical properties of β-phase has been investigated with DFT calculations as well. Moreover, the PBTNG device exhibits outstanding output voltage (171.8V) with a maximum power density of 2.03 Wm^{-2} under continuous finger impartation and can illuminate LEDs under heel pressing and finger tapping. Additionally, the wearable PBTNG device traps the biomechanical energy from different body movements like heel pressing, feet tapping, blood flow etc. and converts them into electrical energy easily. The negative layer (SBTNG) of the device exhibits high sensitivity value (20.2 V/kPa) at low pressure region (<0.5 kPa) which helps in electricity generation from small scale mechanical energies such as writing on the device, mouse clicking, keyboard striking, external CD drive running etc. Thus, self-powered and wearable energy harvester can be used in our daily life as a substitute of batteries.

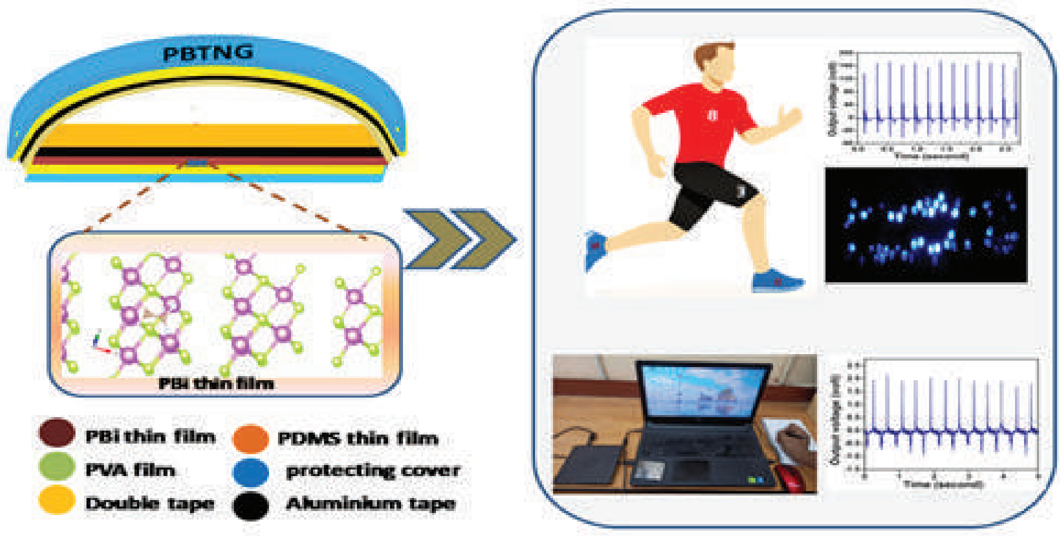

Figure: *Schematic representation of PBTNG device and generated output voltage from different mechanical energy resources.*

1. (OH) 2/PVDF-TrFE piezoelectric composite. Chemical Engineering Journal 146322.

Biography

Debmalya Sarkar is a senior research scholar of Jadavpur University under Department of Physics. He has completed his Bachelor's degree and Master's degree in 2016 and 2018 respectively from Jadavpur University with Physics honors. His main research topics are fabricating nanocomposites and harvesting mechanical energy with the help of piezoelectric, triboelectric nanogenerator by using natural available materials and functional nanoparticles. He also has expertise in designing of hybrid energy harvester and utilizing them in detection of human physiological signals, robotic gestures etc. Currently, he has broadened his research interest in piezocatalysis to purify the waste water and generate electricity from water droplets.

Superplastic formability and cavitation analysis of aa7075 matrix

G. Kumaresan[2] and **S. Sivalingam**[1]

[1]*SRM Valliammai Engineering College, India*
[2]*Anna University, India*

In this present work, the AA7075 was selected as matrix material and boron carbide (B4C) particles as reinforced material with several weight percentage of B4C particles (2, 4 and 6) and were prepared by two step stir casting technique to distribute the reinforced particles uniformly in the composite. It is one of the method to increase ductility of the composite is superplastic deformation, to exhibit very large elongation without failure.

The basic require- ment of fine structure superplasticity is the average grain size of the specimen is less than 10 lm; to achieve this fine grain size through the thermomechanical treatment process includes furnace cooling from the solution treatment to the overaging, warm rolling, recrystallization and aging treatment. The superplastic forming and cavitation behavior of the prepared composite under biaxial stress were investigated under constant forming pressure and temperature of 0.2 MPa and 550°C, respectively. The formability and cavitation effect of composites were entirely different from the normal superplastic alloys. The yield strength and ultimate tensile strength have reduced drastically after addition of 4% B4C particles the main reason was agglomeration of the ceramic particles. In the superplastic forming process the sample B exhibits very high formability of dome height at 16.5 mm compared to the samples A and C. It is due to the uniform distribution of the particles without agglomeration on the grains as well as along the grain boundaries.

Biography

1. **Name** : **Dr. G.KUMARESAN**

2. **Academic Profile**

Degree	Branch/Specialization	Class	Year of passing	College	University
B.E	Mechanical Engineering	I	1999	R.V.S College of Engineering and Technology	Madurai Kamaraj University
M.E	Manufacturing Engineering	I	2004	Madras Institute of Technology	Anna University
Ph.D	Production- Metal Forming		2013	Madras Institute of Technology	Anna University

PROFESSIONAL EXPERIENCE:

Post Held	Period		Total service		College
	From	To	Year	Month	
Graduate Apprentice Trainee	19-01-2000	18-01-2001	1	-	Bharath Electronics Limited, Chennai
Lecturer	14-06-2004	03-07-2007	3	1	Sapthagiri College of Engineering
Lecturer	04-07-2007	09-08-2008	1	1	Rajiv Gandhi College of Engineering
Teaching Research Associate	11-08-2008	31-05-2013	4	10	Madras Institute of Technology
Teaching Fellow	20-06-2013	02-05-2023	9	11	Madras Institute of Technology
Assistant Professor	03-05-2023	Tilldate	-	-	Madras Institute of Technology

VIRTUAL EVENT

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Advanced Materials Science World Congress

March 21-22, 2024

Investigation on hydrothermal liquefaction of algae waste into calorific rich bio fuel

Periyasamy Sivanandi and **Viswanathan Santhosh**

Mechanical Engineering Department, Government College of Technology, India

The most popular method for producing useful products from waste biomass was the thermochemical conversion process. The most popular processes for turning waste into liquid hydrocarbons include hydrothermal process, pyrolysis, and hydro deoxygenation. The current research is to turn wet biomass into bio-oil at a moderate temperature (200-380°C), pressure (5-20 MPa) at various time using the hydrothermal liquefaction (HTL) process (15–60 min). The HTL method turns a variety of wet biomasses into bio-oil, including microalgae, wood biomass, agricultural waste, sewage sludge, etc. This investigation the possibility of utilizing post-sap residues for bio-oil production, produced after liquid fertilizer extraction from *Kappaphycus alverizii* of red macroalgae and as well as from macroalgae of *Gracilaria Sp*. This study examines how macroalgae cake liquefies hydrothermally at varied liquefaction temperatures, holding times, biomass to solvent ratio, and catalyst dosages to understand its influence over the product distribution and composition from the HTL process. The HTL reactor was operated in presence of a ZSM-5 and catalyst as well as Na_2CO_3 at 300°C using 20g of biomass for certain duration with the feedstock of *Kappaphycus alvarezii* and *Gracilaria Sp* for better yield. Still, the bio-oil derived from the HTL process seems to contain higher oxygen content. Hence, the hydro-deoxygenation (HDO) process was carried out to upgrade the crude bio-oil into oxygenates less oil. Catalysed HDO processes were able to improve the HHV of upgraded oil to 36.7 MJ/kg. Overall, this study implies that the crude bio-oil can be effectively produced from the post-sap residue, which can be further upgraded to calorific-rich fuel.

Biography

Dr. S. Periyasamy, currently working as Associate Professor in the Department of Mechanical Engineering, Government College of Technology, Coimbatore. He was completed his B.E Mechanical Engineering (TPGIT) from Madras University and his M.E (MIT) from Anna University. Also done his Doctoral degree under Anna University in the area of IC engine thermal and design domain. He has an experience of 22 years and more in the academic and two years in the industry. He is dedicated to develop the combined system analysis of Thermal and Design, has a lifelong fascination with bio fuel generation and its combustion, design of thermal systems and its safety. He has published more than sixty papers in the international and national journal. He is an approved research supervisor of Anna University and has produced 6 PhD and 3 more PhD thesis is in the evaluation. He is also a resource person for Academic Council, Academic evaluation committee, Board of Studies, Affiliation Committee, Doctoral Committee, Academic Audit and subject expert for various Institution and University.

Synthesize of low-cost carbon material based environmental gas sensor

Shivani Dhall

DAV College Jalandhar, India

In this modern and developed civilization, air quality is one of the main concerned issue for human survival and a healthy environment. Various hazardous and deleterious gases such as H_2S, NH_3, NO_2, H_2, CO, CH_4 or volatile organic compounds (VOCs) including benzene, toluene, formaldehyde, chloroform etc. are introduced into the environment from different industrial processes. Leakage of such toxic and explosive gases above the marginal level may result in loss of human life. So, the detection of these toxic and explosive analytes is essential for public safety purposes, controlling automobile and industrial exhausts etc. To overcome this problem, research on the development of portable and miniature environment gas sensors is underway through nano-engineering. The main objective of this work fabricates carbon nanomaterials-based gas sensor which shows modest sensitivity at room temperature condition for low concentration of H_2 gas.

Biography

Dr. Shivani Dhall has been working as an Assistant Professor in the Department of Physics, D.A.V. College, Jalandhar, since July 2018. Previously, she worked as a NPDF in Department of Physics, IITD. During her PhD, she worked in CEN, Electrical Department, IIT Bombay. She got best INUP project award from IIT Bombay in 2015. In 2018, she awarded with CSIR Nehru and DS Kothari Fellowships. In 2019, She received TARE project under DST for continue her research work. She is working on carbon materials, nanoparticles and their device fabrication using lithography technique for gas sensing, photo-sensor and interconnected applications. She is reviewer of many SCI journals. She has 22 SCI Journals publications.

Modulation of magnetic and electric properties of Cr doped Mn_3TeO_6 multiferroic materials

S. J. Sondarva

Sardar Vallabhbhai National Institute of Technology, India

The systematic investigation in magnetic and electric properties of Chromium (Cr) doped Mn_3TeO_6 multiferroic material is carried out in this communication. The $Mn_{3-x}Cr_xTeO_6$ (x = 0.02, 0.04, 0.06,0.08) materials synthesized using solid state reaction route. The structural investigation from X-Ray Diffraction (XRD) analysis revealed that all the synthesized materials crystallized in trigonal (Hexagonal axes) crystal structure in $\bar{R}3$ space group in single phase. The compositional purity verified by Energy Dispersive Spectroscopy (EDS). The High Resolution Transmission Electron Microscopy (HR-TEM) carried out for morphological study of materials. The Small Area Electron Diffraction (SAED) shows good agreement with the structural results. For Detail electric properties confirm decrease in activation energies and resistance with rise in doping concentration. The decrement in resistivity with temperature reveals negative temperature coefficient of resistance in materials. The impedance study carried out in detail to investigate conduction mechanism and various electrical parameters. The temperature dependent magnetic study suggested antiferromagnetic behavior of all the studied materials below 15 K. The highest coercivity value obtained for the x = 0.08 Cr doped material. The saturation magnetization shows falling trend with rise in doping. A low temperature (15 K) hysteresis loops indicate the formation of the long-range weak ferromagnetic ordering. This indicates that the Cr doping significantly influences electric and magnetic properties in Mn_3TeO_6. The overall capacitance of the materials increased with Cr substitute, which reflects the potential use of the material in energy storage technologies.

Biography

Dr. Sohal Sondarva studied physics at the Saurashtra University, Rajkot and graduated in 2010. She later pursued M.Sc. at the same university in 2013 in physics. Then she did M. Phil at the same university in Physics (condensed matter physics). She joined Sardar Vallabhbai National Institute of Technology, Surat and pursued Ph.D under the guidance of Dr. Dimple Shah. She received degree in 2023. She has published research articles in reputed SCI journals of physics.

Clinical application and pharmacological mechanism of polyherbal phytoformulations in breast cancer and depression treatment: A network pharmacological analysis

Vijaykumar Sudarshana Deepa and **Mayank Roy Chowdhury**

Department of Biotechnology, National Institute of Technology, India

Background: Breast cancer and depression are two prevalent health conditions that require effective treatment. Traditional medicinal systems have identified several plants with activity against these conditions, but their mechanism of action remain unclear. This study aims to predict and verify the potential molecular targets and pathways of a polyherbal phytoformulation in the treatment of breast cancer and associated depression.

Methods: We review 61 plant species with anti-breast cancer and anti-depressant properties, and narrowed down our selection to three plants for further investigation. Using criteria for oral bioavailability (OB≥ 30%), drug likeness (DL ≥ 0.18) and "Rule of five" (RO5), we extracted 71 active ingredients and 168 associated targets. We evaluated the clinical efficacy of phytoformulations containing Moringa oleifera (M.O), Coccinia indica (C.I), and Amaranthus spinosus (A.S) as active constituents, and determined their effective chemical components. Network pharmacology analysis identified key targets and pathways of the polyherbal phytoformulation in the treatment of breast cancer and associated depression. Additionally, molecular docking verified the core components and the targets of the formulation, predicting the interaction sites.

Results: Our results indicate that polyherbal phytoformulations (MCA) targets potential molecular targets and pathways for breast cancer and associated depression treatment. We identified several key targets and pathways of the formulation and verified the core components and targets using molecular docking. Conclusion: In conclusion, our study provides a theoretical and scientific basis for the clinical application of MCA and may be useful in developing more effective treatments for breast cancer and depression.

Biography

Dr. V. Sudarshana Deepa is working as Assistant Professor and Head in the Department of Biotechnology at National Institute of Technology -Andhra Pradesh (An Institute of National Importance) with 11 years of teaching and research experience. She is a recipient of Young Scientist Start Up Grant from SERB, Govt of India. Her areas of interest includes Phytochemistry, Pharmacology, Computational Biology, Environmental Biotechnology and Nanotechnology. Two patents have been already published. She has performed several administrative roles in the department and institute level. Her extracurricular activities include classical dance Bharatanatyam.

Green nanotechnology approach towards the conversion of agro waste into innovative nanoparticles

N. Kaur

Goswami Ganesh Dutta Sanatan Dharma College, India

The green nanotechnology is a widely used strategy for the synthesis of agro waste-nanoparticles (NPs). The usage of agro waste helps in the reduction of environmental pollution and minimized lethal effects. The produced agro waste – NPs possess good thermal, chemical, mechanical, optical and conductivity properties. These NPs also possess other superior features in terms of selectivity, stability, reusability and efficiency. Moreover, the agro waste serves as cheap and easy available raw material for the NPs synthesis. The agro waste mainly crop, plant, fruit, food and industrial waste is significantly in use for the development of beneficial NPs. Numerous techniques such as FTIR, SEM, TEM, TGA, XRD, EDX and UV spectra confirms the successful development and characterizations of NPs. Besides production, these NPs could be used in various application areas such as sensors, electronics, pollutants remediation, drug delivery, anti-cancer, anti-microbial, anti-oxidant studies etc. So, the core objective of the study was to provide deep insights about the types of NPs that could be produced from different agro waste along with their applications in numerous emerging fields. The production method involves low cost investment, minimum energy utilization and pollution free. Commercialization of these NPs at an industrial level should be envisaged for the large scale production of nano devices in the agricultural field. The agro waste - NPs hybrid mixture can serve as a suitable packing material for the human benefits.

Biography

She was currently working as Assistant Professor in the GGDSD College, Chandigarh, India. She has completed her PhD from Department of Biochemistry, Panjab University Chandigarh, India. Her research area is nanotechnology, sensors, pollutants detection and biochemistry. She has number of publications in the reputed international journals. She also a member of editorial board of The Applied Biology and Chemistry Journal. She has attended significant number of national and international conferences. It’s always an immense pleasure for her to learn from the young scientists, researchers, professors or delegates all over the world.

Luminescent Properties of mix rare earth ion doped alkali fluoro borate glasses for solid state lighting applications

Satish khasa and **Jyoti Dahiya**

Department of Physics, Deenbandhu Chhotu Ram University of Science and Technology, India

Multi-component glasses with compositions x(La_2O_3)•(1-x)Dy_2O_3•10Bi_2O_3•30LiF•60B_2O_3 (where La_2O_3= Eu_2O_3, Sm_2O_3) were synthesized via melt-quench technique to explore their application as LED material. X-ray diffraction profile of all the prepared compositions, confirmed the short-range order and amorphous nature of prepared samples. Their luminescent properties were studied and compared via UV-Vis-NIR and Photoluminescence studies. From UV-Vis-NIR spectroscopy the obtained direct optical band gap (Eg) values suggest semiconducting nature of prepared samples. Low values of Urbach energy indicated the presence of a smaller number of disorders and defects in the matrix. The nephelauxetic effect revealed the nature of RE-O bond in the matrix i.e., either covalent or ionic. Photoluminescence excitation and emission spectra were studied for both RE ions co-doped in the glass matrix for a variety of excitation wavelengths. The obtained colour parameters like CIE coordinates, CCT, CP% and CRI and Y/B Ratio were correlated with standard white light parameters. CIE coordinates of composition DELBB (x = 0.2) excited at wavelength 380 nm found to be (0.329, 0.342), lies closest to white light coordinates (0.333, 0.333). It has low colour purity (1.8%), high colour rendering index (58) and Y/B ratio is approaching one (1.08) which is the prime requirement.

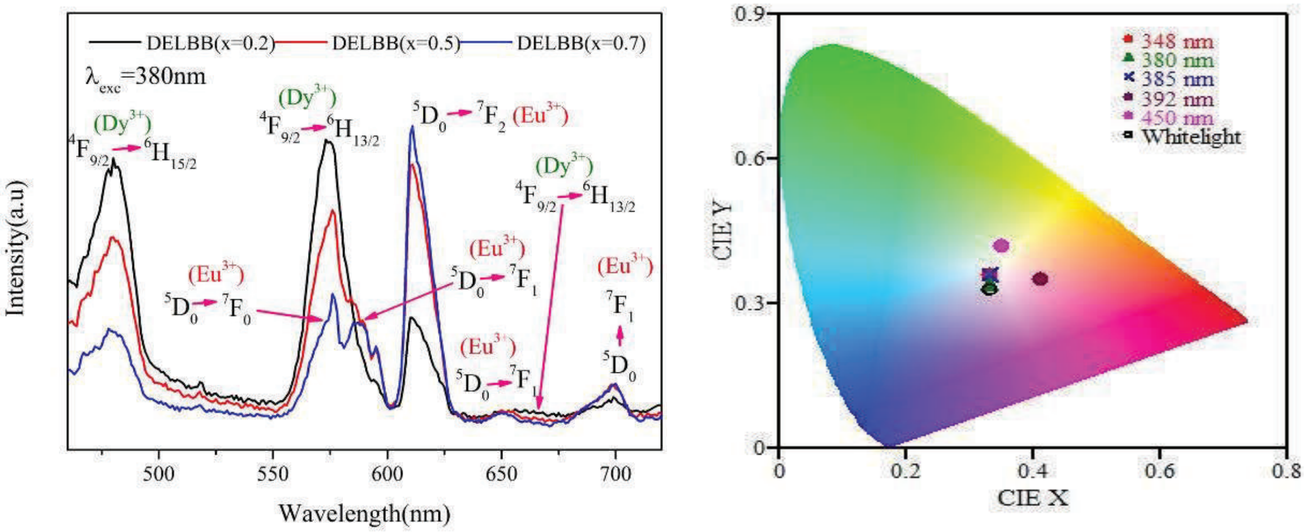


***Fig.1** (a) PL spectra of Dy3+ and Eu3+ co-doped lithium bismuth borate glasses for excitation wavelength 380nm (b) Chromaticity Diagram of glass composition DELBB(x=0.2) excited at different excitation wavelengths*

This composition is suitable for Cool WLEDs application as its CCT was evaluated as 5667K which lies in cool white region. In present work, it was observed that as an effect of co- doping of RE ions, emission colour can be tuned from cool white to neutral white and warm white region by varying excitation wavelengths. Thus, the prepared glasses are potential colour tuneable luminescent materials.

Biography

Dr. Satish Kumar currently holds the position of Full Professor in the Physics Department of Deenbandhu Chhotu Ram University of Science and Technology, located in Murthal, Haryana, India. He possesses three decades of teaching expertise in addition to commendable research experience. His research focuses on the synthesis, characterization, and characteristics of rare earth/TMI doped oxide glasses, glass ceramics, bioactive glasses, hydroelectric cells, and WLED materials. He has authored over 100 papers in journals indexed in Web of Science (WoS) and Scopus, in addition to writing three textbooks for undergraduate courses. Under his direction, a total of thirty five M.Sc. students and more than fifty Dual degree students successfully finished their project (dissertation work)

Glucuronic acid-conjugated smart cellulose nanocrystals as novel carrier for gemcitabine delivery

Mehdi Faramarzi

Islamic Azad University, Iran

A novel targeted smart drug-delivery system (SDDS) was designed for gemcitabine delivery purposes. Initially, cellulose nanocrystals (CNC) were grafted with allylamine, acrylic acid, and N-vinylcaprolactam via free-radical polymerization to prepare smart CNC, functionalized with amine and carboxyl groups. Thereafter, glucuronic acid, as a tumor-targeting ligand, was conjugated with the amine groups of the prepared nanoparticles in order to fabricate SDDS. Gemcitabine was further loaded onto the SDDS via adsorption. Thermodynamic and isotherm studies also revealed that gemcitabine adsorption was followed by the monolayer spontaneous physisorption. Next, the *in vitro* gemcitabine release from the given SDDS was analyzed, at 40 °C and 37 °C and pH = 7.4 and pH = 4.5, which revealed a very good temperature- and pH-responsive behavior. Further, kinetic studies indicated drug release followed by the Fickian diffusion-controlled process. The *in vitro* cytotoxicity assay was performed on human prostate cancer cell line (PC3), which showed the SDDS had significant biocompatibility, and the gemcitabine loaded SDDS had outstanding killing capability against PC3 cells.

Biography

Mehdi Faramarzi is assistant professor in Department of Chemical Engineering, Gachsaran Branch, Islamic Azad University, Gachsaran, Iran

Luminescence study of the rare earth ions (Nd3+) doped in Sr3Bi(PO4)3

N.S.Ugemuge[2], Supriya Kshetrapal[1], Renuka Nafade[3] and **S.V.Moharil[4]**

[1]S.F.S. College, India
[2]Anand Niketan College, India
[3]Shri Ramdeobaba College of Engineering and Management, India
[4]RTM Nagpur University, India

The host Sr3Bi(PO4)3 and series of the rare earth ions (Nd3+) doped phosphors were prepared by using high temperature solid-state method at 1100 C in air. To the best of our knowledge, no paper has been published on the preparation of (Nd3+) doped Sr3Bi(PO4)3 phosphor .The phase identification and the morphological nature were studied by Powder XRD and SEM characterization tools respectively. The UV – NIR and the energy transfer (ET) mechanism of (Nd3+) doped phosphors were studied. The emission and excitation spectra were measured The luminescence intensity was enhanced with increasing (Nd3+) content and the emission reached the maximum intensity at x=0.05 in Sr3Bi(PO4)3:x (Nd3+). Moreover, the concentration quenching effect of (Nd3+) in Sr3Bi(PO4)3 can be observed. The energy transfer behaviour in the phosphors discussed. Reitveild refinement of the above sample was studied.

A promising host materials for easy-synthesis, cheap price, high efficiency and chemical/chemical-stabilities over a quite wide range of temperature are Phosphates, hence we prepared above sample which can be beneficial in a variety of industries.

Simulation of part through surface crack in bi-material pipe using XFEM

Somnath Bhattacharya and **Vaibhav Sonkar**

National Institute of Technology, India

Objective: Failure of most of the engineering components and structures start from cracks. To avoid the catastrophic failure of components and structures and ensure the reliability fracture analysis is very important. In the present study, semi elliptical part through circumferential crack in bi-material pipe is simulated using extended finite element method (XFEM). Bi-material consists of two dissimilar materials with distinct properties. Bi-material pipe consists of inner pipe made of steel alloy and outer pipe made of ceramic. In bi-material pipe, circumferential semi-elliptical surface crack at different location is used for three dimensional fracture analysis of bi-material pipe.

Method: XFEM is a numerical method developed for modelling the discontinuities without remeshing and mesh refinement. Standard displacement based approximation function is enriched near crack (discontinuities) through partition of unity method. Bi-material pipe is subjected to internal pressure. Stress intensity factor (SIF) is computed at different location of crack front of semi elliptical surface crack using virtual domain extension approach.

Results: SIFs have been determined on the crack front at different angular locations. The obtained results inferred that mode-I SIF (KI) dominates as compared to mode-II SIF (KII) and mode-III SIF (KIII).

Conclusion: 3D fracture mechanics problems having semi elliptical circumferential crack located at different locations in bi-material pipe can be solved using XFEM. The maximum value of KI is found more when crack is present at outer surface as compare to the inner surface of the inner pipe and outer pipe of the bi-material pipe. Thus it can be concluded that severity of the crack is more at outer surface.

Biography

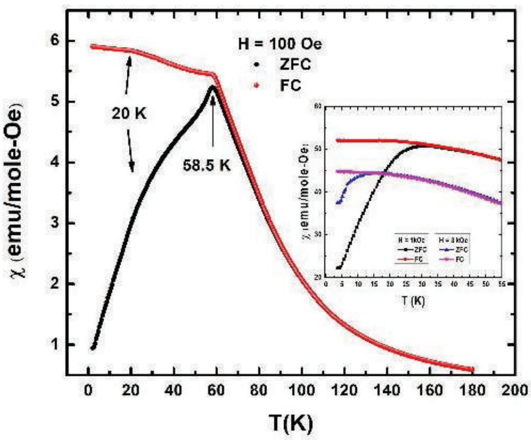
Dr. Somnath Bhattacharya is currently working as Associate Professor in the Department of Mechanical Engineering, National Institute of Technology Raipur, India. He obtained his Ph.D. from Indian Institute of Technology, Roorkee, India in 2012. Finite element methods, vibration analysis, fracture mechanics and extended finite element methods are his fields of research.

Observation of conventional and inverse magnetocaloric effects in $(Dy_{0.6}Gd_{0.4})5Pd_2$

Tapas Paramanik[1], **Shuvendu Ghosh**[1] and **I Das**[2]

[1]*Department of Physics, School of Sciences, National Institute of Technology Andhra Pradesh, India*
[2]*CMP Division, Saha Institute of Nuclear Physics, India*

Rare-earth-based binary intermetallic compounds of the R_5Pd_2 (R= Tb, Dy, Ho, Er) series have attracted material scientists and researchers because of their complex magnetic behaviour and the high magnetocaloric effect (MCE) from the viewpoint of fundamental studies as well as technological aspects. Structural, magnetic and magnetocaloric properties in $(Dy_{0.6}Gd_{0.4})5Pd_2$ compound have been studied to explore the origin of both conventional and inverse magnetocaloric effect (IMCE) in this compound. Like all other members of the R_5Pd_2 series, the prepared sample forms in cubic (Fd3m) structure. The magnetic measurements indicate the presence of double magnetic glass transition below the 58.5 K. Heat capacity data reveal the absence of long-range magnetic ordering. The system exhibits a conventional magnetocaloric effect above 20 K with a peak value of magnetic entropy change ($-\Delta S_M^{max}$) 7.4 J/kg-K at 90 K under the magnetic field change of 70 kOe. The observed value of inverse magnetocaloric effect is -14 J/kg-K for 70 kOe external magnetic field change at T= 4.9 K. The observation of large IMCE below 20 K reflects huge randomness in the spin configuration due to the modification of d-f exchange interaction in this compound. The relative cooling power (RCP) was estimated for the temperature around 90 K and the obtained value of RCP at 70 kOe magnetic field is about 673 J/kg. The presence of large MCE and IMCE makes this material important for possible applications in the field of magnetic heating or cooling-based constant temperature bath.



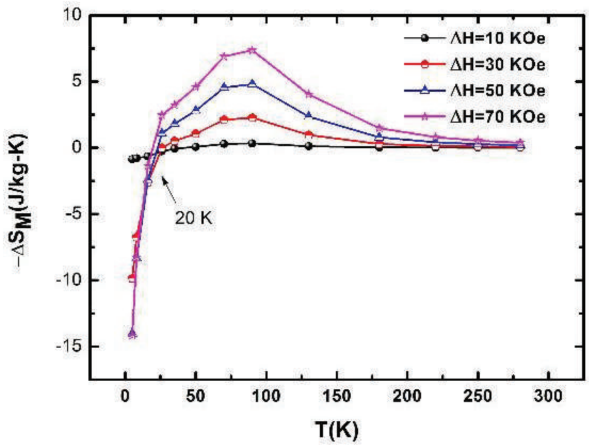


Figure: (a) The temperature dependent dc magnetic susceptibility (χ) at 100 Oe magnetic field under ZFC and FC conditions for $(Dy_{0.6}Gd_{0.4})_5Pd_2$. Inset: ZFC and FC magnetization measured as a function of temperature in 1 kOe and 3 kOe applied magnetic fields for $(Dy_{0.6}Gd_{0.4})_5Pd_2$ in low-temperature region. (b) Temperature-dependent magnetic entropy change ($-\Delta S_M^{max}$) under different applied magnetic field change.

Biography

Dr. Tapas Paramanik is working as an Assistant Professor in the Dept. of Physics, School of Science at NIT Andhra Pradesh. He completed his Masters in Physics from IIT Kharagpur in the year 2010. He has pursued Doctoral degree from Saha Institute of Nuclear Physics, Kolkata and received Ph.D. in Experimental Physics in the year 2017. He has worked as Postdoctoral fellow at S. N. Bose Center- Kolkata, JNCASR- Bangalore and IIT-Kharagpur from 2016-2018.

His area of research includes the magnetic and magnetocaloric properties of alloys and compounds, magnetic switching behavior, multiferroic materials, topological insulators, nanomaterials etc. He has published around 20 research papers in peer-reviewed international journals of high repute e.g. Asia Materials (Nature Publishing Group), PRB, APL, RSC Advances etc. He has completed/ongoing three sponsored research projects funded by SERB, UGC DAE CSR. Three research scholars and one project assistant are currently working under his supervision.

Optimization of CMT welding process parameters of dissimilar hot rolled E250 and polymer sandwich steel lap joints

Bipin B Sharan[1], Prabha Chand[1], Mayuri Baruah[1], and **K Gopala Krishna[2]**

[1]Department of Mechanical Engineering, National Institute of Technology, India
[2]Materials Engineering Division, CSIR –National Metallurgical Laboratory, India

Lap joints of 1.5mm thin sheets of dissimilar hot rolled E250 with polymer sandwich steel (MPM) were produced by Cold metal transfer (CMT) process, closer to the real application. 0.1mm polymer layer polystyrene-butadiene-styrene sandwiched between two 0.7mm DC06 sheets of MPM was found to be intact at significantly lower heat inputs (0.16-0.24 kJ/mm), which otherwise had been quite challenging during TIG welding leading to huge rejections. After several iterative trials for acceptable weld quality, experiments were conducted as per L9 orthogonal array,Taguchi technique with welding speed (WS),wire feed rate(WFR) and welding torch orientation (TO) as the process parameters.The joints were investigated through optical macrograph, micrographs, hardness, tensile lap shear tests and fractography on the fractured specimen. Optimum parameters were determined for maximizing shear strength. The sample with optimised parameters exhibited 6% improvement in shear strength achieving 152.09 MPa and polymer layer retention. ANOVA analysis suggested welding speed to be most significant parameter with 69.85% contribution affecting shear strength. Coefficient of determination (R_2) for the shear strength was 87.26% derived from the linear regression model. Significantly lower error 0.96% computed from the confirmatory test concluded very effective optimization.

Biography

Bipin Sharan has professional career spanning more than 36 years with M/S Tata Motors and presently heading manufacturing operations of Defence Vehicles, TML Jamshedpur.

Currently Pursuing Doctoral Programme in Mechanical Engineering at NIT Jamshedpur.

He is highly competent professional and has hands on experience in the area of Manufacturing Operations, Quality Assurance, Process Enhancement, Project Management, EHS and Sustainability.

Has been Member on the board of Jury for Evaluation of Projects under Tata INNOVISTA, across all Tata Group Companies as Operations Excellence SME.

Certified Master Black Belt on Six Sigma process and has mentored more than 20 Green Belt projects.

Certified Trainer by M/S Dale Carnegie, TQMI, and DuPont and have more than 5000 Hours of training & coaching to Leadership Team in areas of "Leading Safety Efforts", "RCFA", "Incident Investigation, "Felt Leadership", "DWM" in TQM framework, and "Lean Management" in Operations Excellence.

Has pioneered and mentored Digitization initiatives in SHE & S space.

Certified Lead Assessor "ISO 45001" on OH&S Management System.

Has been associated with many Professional bodies CII GreenCo Forums, Sustainability Task Force Eastern Region India, and CII Jharkhand Safety Panel.

Photo biobattery module

Anand Kumar K S

CSIR-National aerospace Laboratories, India

We demonstrated an innovative photo biobattery module that can generate bioelectricity from microalgae based on the principle of redox reactions of photosynthesis. The microalgae biomass is the sole electron donor with easily biodegradable proteins and carbohydrates utilized to transfer the produced electrons to the anode of a hybrid microbial fuel cell, providing power for external applications. Furthermore, this proposed photo biobattery module has in comparison to other batteries the ability to allow a recharge using sunlight without an external power supply by providing hundreds of mill amperes that can be scaled up to revolutionize the power performance for real-world applications.

Biography

Anand Kumar K.S. (born May 24, 1975) is a technologist and, green thinker is currently Principal Technical officer, Aerospace Electronics and System division, at the CSIR- National aerospace Laboratories, Bangalore, India. In the period from March 7, 2006 to Feb. 15, 2008, he held a position of Assistant Engineer Electrical of University works Department, Banaras Hindu University, Varanasi, India Building, Environment and Energy. He received his Diploma from Government Polytechnic, Tumkur, Karnataka, India, AMIE Degree from The Institution of Engineers (India) and M.Tech degrees from JNTU Hyderabad and PhD from IIT Banaras Hindu University. He also had an experience of an R&D engineer with an Electricity, Water and Sewage System in Varanasi during his tenure with Banaras Hindu University, researching on Hybrid-micro hydro power generation using municipal waste water and its reliability evaluation. His technology contributions are in a broad area linking waste management, green energy conversion system and ambient air purifier. He was awarded the Gandhian Young technological Innovation Award, Design Impact award, Skoch Award, Bharath Vikas Award and CSIR-NAL Special Mention Award.

Electrooxidation of leachate: Understanding effect of cathode material and process optimisation using response surface methodology

Abhipsa R Makwana[1], **Chintavi Patel**[1] and **Abhilash Nair**[2]

[1]*The Maharaja Sayajirao University of Baroda, India*
[2]*National institute of Advanced Manufacturing technology, India*

The present study aims to evaluate the efficacy of the electrooxidation (EO) process using graphite and stainless steel electrode for the primary treatment of leachate generated from the industrial waste landfill site. Response surface methodology (RSM) was used to optimize process variables, viz., initial pH, current density, and electrolysis time to obtain maximum COD removal. The optimum 30mA/cm2 current density, initial pH 7 and 35 min electrolysis time with graphite cathode showed 89.53 % COD removal. While stainless steel cathode showed 75.30% COD removal with19.70 mA/cm2 current density, initialpH5.5, and174- min electrolysis time as suggested optimum conditions. The results indicated that the graphite cathode improved EO performance compared to stainless steel.

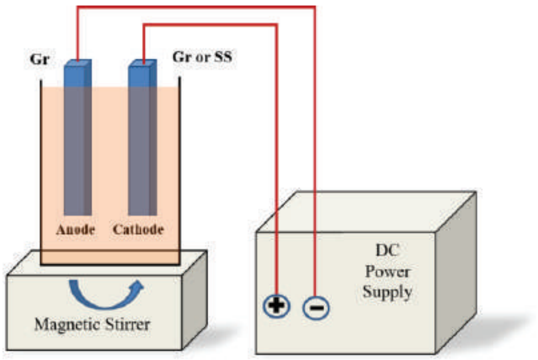


Fig. 1. Schematic representation for experimental set-up

Table 1: Leachate Characteristics

Parameter	Unit	Value
pH	-	7.3 ± 0.3
COD	mg/L	1450 ± 250
Conductivity	μS/cm	6.0 ± 0.2
Chloride	mg/L	1360 ± 40
Turbidity	NTU	75 ± 5
TDS	mg/L	3612 ± 12
TSS	mg/L	180 ± 20
TKN	mg/L	58 ± 2
Total Hardness	mg/L	915 ± 15
Alkalinity as $CaCO_3$	mg/L	310 ± 10
NH_3-N	mg/L	9.48 ± 0.52
Phosphate	mg/L	16.60 ± 0.01

Biography

Dr. Abhipsa R Makwana, serving as Assistant Professor at the Maharaja Sayajirao University of Baroda in Civil Engineering Department of Faculty of Technology and Engineering. She did her PhD in Environmental Engineering from National Institute of Technology, Surat. Gujarat, India. She has more than 19 years of teaching experience with 12+ years research experience. She has guided more than 25 Master's dissertations. Currently one student is doing PhD under her supervision. Her research area is mainly related to wastewater treatment, solid waste Management and noise monitoring and modeling. She has published more than 9 papers in Scopus indexed journals and more than 50 papers in various national and international conferences. Her H-index is 4 with more than 219 citations.

Eco-friendly synthesis of Zinc Oxide nanoparticles for food packaging application-A review

D.B. Roy[1] and **M.Bhandari**[2]

[1]*Ajeenkya D Y Patil University, India*
[2]*Sonakshi Milk Products Pvt Ltd, India*

The Study of nanoparticles has been increased in last many years which have resulted in revolutionary change in various fields such as Physics, Chemistry, Biomedical, Medical and Industrial Chemistry etc. From the study of nanoparticles, it gives rise to Nanotechnology. Zinc oxide has good physical and chemical properties, so it can be researched to improve its utility. Zinc nanoparticles have some special characteristics that they can be quickly removed from water with help of external magnetic property. In the functioning of Zinc oxide nanoparticles, polymer also plays an important role. In various ways zinc oxide has been employed in antimicrobial properties and is effective in combating a wide range of bacteria. This paper reviews the various methods of eco-friendly preparation to synthesize ZnO nanoparticles, which could be used in food packaging applications.

Investigating the anticorrosion capabilities of PLGA/HA hybrid coatings on Mg alloys for bioimplant applications

Navdeep Singh Grewal and **Sukhdeep Singh**

Guru Kashi University, India

This study presents a comprehensive investigation into the potential of PLGA/HA hybrid coatings for enhancing the corrosion resistance of biodegradable magnesium (Mg) alloys, particularly in the context of bioimplant applications. The corrosion of Mg alloys in physiological environments remains a significant challenge, limiting their practical utility in biomedical devices. To address this issue, we employed a hybrid coating composed of poly(lactic-co-glycolic acid) (PLGA) and hydroxyapatite (HA), aiming to create a protective barrier against corrosion while promoting bioactivity. Our research employed a combination of electrochemical techniques, surface characterization, and *in vitro* assessments to evaluate the anticorrosion properties and biocompatibility of the PLGA/HA-coated Mg alloy. The results indicate a substantial reduction in corrosion rates and increased resistance to degradation compared to uncoated Mg alloys. Moreover, the coating exhibited favorable biocompatibility, as evidenced by cell viability assays and cell adhesion studies. This work underscores the potential of PLGA/HA hybrid coatings as a promising strategy to improve the corrosion resistance of biodegradable Mg alloys, thus advancing their suitability for bioimplant applications. By mitigating corrosion-related concerns, this research contributes to the development of more durable and biocompatible materials for the next generation of biomedical implants.

Biography

Dr. Navdeep Singh Grewal, Assistant Professor, Dept. Of Mechanical Engineering, Guru Kasi University, possesses over 7 years of extensive research experience. Serving as the first author, he has contributed to high-impact factor journals such as Bioactive Materials (IF 18.9), Journal of Magnesium and Alloys (IF 17.6), and other esteemed SCI journals. His primary focus has been on the design and characterization of intricate organic/inorganic multi-layered coating architectures. These coatings were strategically engineered to tailor the degradation rate of biodegradable implants within biosafety limits, with a specific emphasis on influencing the controlled degradation of bioresorbable Mg alloys. Dr. Singh's work extends to the ingenious design of coating systems that seamlessly incorporate a diverse array of bio-functionalities. This innovative approach allows for the adept fulfilment of a broad spectrum of clinical requirements. His expertise spans various techniques, including non-solvent to solvent-induced phase separation (NIPS), Polymer-induced liquid precursor (PILP), anodization, chemical conversion, and Sol-gel methods.

Interactions of weak shocks in isentropic drift-flux model of two-phase flows

Minhajul and **Rakib Mondal**

Birla Institute of Technology and Science Pilani, India

Multi-phase flows have various practical applications in many industries and engineering fields, including oil industries, medical and genetic engineering, food industries, chemical engineering and so on. Therefore, it is very important to study such model both from physical and mathematical point of view. Due to the existence of movable and deformable interfaces in multi-phase flows, it becomes more complex as compared to single-phase flow. One of the most common example of multi-phase flows are the two-phase flows such as liquid–gas flows, liquid–solid flows, gas-plasma flows and so on. Moreover, the two-fluid model and the drift-flux model are two standard models describing the dynamics coupling between two-phase flows. The drift-flux model is one of the basic and simplest models of two-phase flows. It consists of two mass and momentum balance equations for each phase along with some additional closure laws. However, various nonlinear wave phenomena can be well illustrated by making use of the structures of Riemann solutions for these models. So, it becomes a useful tool for studying nonlinear systems. Therefore, it is very important to investigate the Riemann problem and wave interactions for such models.

In this talk, we present the interaction of arbitrary shocks in isentropic drift-flux model of two-phase flows. We use the results of Riemann solution and the properties of elementary waves in the phase plane to investigate the interactions between arbitrary shocks. Further, we use the property of Riemann invariant and reduce the system of equations by taking the projection of elementary waves in the phase plane. Finally, we investigate the interaction of arbitrary shocks in this phase plane.

Biography

Dr. Minhajul is an Assistant professor in the Department of Mathematics, BITS Pilani, K K Birla Goa Campus, India. He has completed his PhD and M.Sc. degree from the Indian Institute of Technology Kharagpur, India. His research area is the hyperbolic system of PDEs, including the Riemann problem, wave interactions, and the global existence of solutions associated with the hyperbolic system of PDEs.

Design of ultra wide band microstrip antenna for microwave imaging application

P. Karuppasamy[1] and **N.S.Yoga Ananth**[2]

[1]Adhiyamaan College of Engineering, India
[2]P.S.R.Engineering College, India

The rapid growing microwave imaging applications demands for, smaller and low profile antennas. This has to put up the microstrip antennas to the forefront. The microwave imaging modalities are used for cancer detection, SAR (Synthetic Aperture Radar), GPR (Ground Penetrating Radar) currently are not sufficient for society's need. The key feature in this field is to observe dielectric constant and conductivity between normal and malignant tissues of cancer in medical field, Microstrip antennas provide characteristics like low profile, inexpensive fabrication, robustness and exhibit versatility. Many wideband applications require small antennas for the operation. So, a ultrawideband microstrip antenna is designed for microwave imaging applications. Vivaldi antenna is usually preferred for this application. A modified Vivaldi antenna is proposed in this work to attain a percentage bandwidth of 142% within 1-6GHz Fractional Bandwidth. The design of the proposed antenna is simulated using HFSS(High Frequency Structure Simulator) software and characteristics such as return loss(dB) and gain(dB) are analyzed and the fabrication of the proposed antenna is done by using Vector Network Analyzer(VNA). In this work, ultrawideband microstrip antenna is designed for microwave imaging applications. Vivaldi antenna is usually preferred for this application. A modified Vivaldi antenna is proposed to attain a percentage bandwidth of 142% within 1-6 GHZ range of frequency. Trial and error method has been used by interpreting modified Vivaldi Antenna. The design of the proposed antenna is simulated using HFSS(High Frequency Structure Simulator)software and as a result, Multiband is obtained in coaxial probe feed at frequencies 4.07,5.16,5.45GHZ. Characteristics such as return loss(dB), gain(dB) are analyzed.

Biography

P. Karuppasamy is obtained his B.E degree in instrumentation & control engineering from Arulmigu Kalasalingam College of Engineering, Krishnankoil, under Madurai Kamaraj University in the year of 1996 and M.E. degree in the specialization of applied electronics from Madurai Kamaraj University in the year of 2000. He obtained his PhD degree in the year of 2018 under the faculty of Information and Communication Engineering, Anna University, Chennai. His areas of interest are non-destructive testing, image processing, internet of things, semiconductor electronics and analog & digital communication.

VIRTUAL EVENT

6th Edition of
Advanced Materials Science World Congress

March 21-22, 2024

Application of shot blasting on bronze alloy to enhance surface integrity

Ramachandra C G[1], **Amarnath M**[2], **Nagesh S N**[3] and **Prashanth Pai M**[4]

[1]*Presidency University, India*
[2]*Indian Institute of Information Technology Design and Manufacturing, India*
[3]*Ramaiah Institute of Technology, India*
[4]*P A College of Engineering, India*

Shot Blasting is widely used in many industries because of its advantages in surface finish also shot blasting will increase the fatigue strength of industrial parts. However, when it comes to the application part when shot blasted to bronze alloy is not very well explored in any literature. Hence, experimentation is carried out on the bronze alloy with shot blasting, where it can improve the friction, wear and lubrication of the interacting surfaces. The surface comparison was done on 3 samples which is, normal tin bronze metal, shot blasted tin bronze metal and shot blasted tin bronze metal with Molybdenum Coating. When compared with these three samples with the help of metallurgical microscope model L-2003A. Result confirms that, the effect of shot blasting on the worsening of surface roughness parameters on grounded surface of Molybdenum coating is higher than normal tin bronze. Wear rate of shot blasted specimens were found to be lower than normal specimens due to surface work hardened layer and eliminating tensile stresses that attempt to stretch or pull the surface apart with inducing compressive residual stress by shot blasting. Hence Surface Integrity is obtained. The tin bronze alloy of molybdenum coating has more strength and wear resistance than normal Shot Blasted process. The voids and dendrites was very less in shot blasted tin bronze metal with molybdenum Coating when compared to the other two samples, which will clearly explain about the significance of the shot blasting.

Biography

Ramachandra C G. Academic Professional with 24 years of Experience in Academic & Training, Research & Development and Academic Administration with B.E., M.Tech., Ph.D., Post-Doc., Qualification. Received 6 Patents. Received 18 Academic Excellence Awards from the National / International Professional Bodies. Written 20 Books in various Subjects of his expertize. Published 17 Book Chapter in Reputed Publishers. Published 111 Papers in Reputed National/International Journals. Presented 116 Papers in International/National Conferences.

Value addition to agro-industrial waste through nanocellulose preparation and its application: A step towards clean and green environment

Rana H. and **Goswami S**

Center of Innovative and Applied Bioprocessing, India

The current imperative is to valorise agro-industrial wastes rich in lignocellulosic components (cellulose, hemicellulose, lignin and pectin etc.) to protect the green environment. The natural biopolymers obtained from these wastes exhibit significant potential for various applications and contribute to the preservation of the natural environment. Cellulose is the most abundant natural biopolymer and cellulose derived crystalline nanocellulose based biopolymer composites has shown a lot of potential in research due to its excellent properties like low density, high stability, good mechanical properties, non-toxicity, and biodegradability. This waste derived cellulose can undergo surface modifications for the preparation of several biocomposites with enhanced physical and mechanical properties, which may be utilized in various commercial applications. The use of waste derived modified nanocellulose as filler (provide mechanical properties) to produce an adsorbent with high swelling and absorption capacity would be a sustainable and innovative approach for waste water remediation. Therefore, agro-industrial waste valorization concept is a sustainable approach for waste management that may go for cyclic economy by producing natural biopolymer-based products and will also contribute to pollution free environment.

Biography

Harshdeep Rana, Senior Research Fellow/Ph.D. scholar in Center of Innovative and Applied Bioprocessing under the supervision of Dr. Saswata Goswami (Scientist-F). Her work focuses on advancing environmental sustainability by valorizing agro-industrial wastes through the extraction of valuable biopolymers and compounds. She possesses expertise in developing numerous valuable bio-composites from these biopolymers, including antimicrobial packaging materials and hydrogels for wastewater treatment. This concept aligns with the idea of transforming waste into wealth.

An approach towards effective utilization of glycerol and acrylic acid for the enhanced production of biopolymer and the environmental impact assessment

Goswami S, Anjana and **Shristhi Rawat**

Centre of Innovative and Applied Bioprocessing, India

Polyhydroxybutyrate (PHB) is a biodegradable-biopolymer produced by different microorganisms. Bacillus pseudomycoides SAS-B1 is a gram-positive rod-shaped halophilic bacterium capable of accumulating PHB-an intracellular biodegradable polymer. In the present study, the optimal conditions for cell cultivation in the seed media were developed. The cells were then cultivated in a two-stage fermentation process utilizing glycerol and Corn Steep Liquor (CSL) as carbon and nitrogen sources, respectively. PHB yield was effectively increased from 2.01 to 9.21 g/L through intermittent feeding of glycerol and CSL, along with acrylic acid. The physicochemical properties of PHB were enumerated using various characterization techniques. Finally, a life cycle assessment was carried out to bring an insight into "How environmentally friendly and sustainably PHB was produced by B. pseudomycoides SAS-B1".

Biography

Dr. Saswata Goswami completed his PhD in Chemical Engineering from NIT Durgapur. He has been serving as Scientist-F Center of Innovative and Applied Bioprocessing since March,2015. Prior to joining CIAB, he served almost twenty years in several Industries, to name some of them- Southern Petrochemical Industries Corporation, Max-Gb (Ranbaxy), Torrent Gujarat Biotech Ltd., Alembic Chemicals Co Ltd. and so on. In industries his technical domain was Process Engineering, Process Development and Manufacturing. His immediate assignment before joining CIAB was as a Scientist in Birla Institute of Technology, Mesra, Ranchi for five years.

Asymmetrical stress controlled cyclic loading of advanced structural materials

Prerna Mishra[1] and **N.C. Santhi Srinivas**[2]

[1]*MKSSS Cummins College of Engineering for Women, India*
[2]*Indian Institute of Technology, India*

The advanced power generating industries use high operating steam temperatures and pressures, to achieve higher efficiency. This led to development of alloys with superior properties at elevated temperatures. The two alloys under investigation are Modified 9Cr-1Mo steel and Inconel 617 alloy. From the application point of view, the two alloys are used as piping and tubing materials in various components such as steam-generator, super-heater, re-heater and heat-exchanger etc. The present investigation deals with the comparative study of the two alloys under asymmetrical stress controlled cyclic loading. Uniaxial asymmetrical ratcheting fatigue tests at room and high temperatures were conducted using servo hydraulic material testing system (MTS model 810). MTS extensometer (Model: 632.53E) was mounted on gauge section of specimen for strain measurement. The parameters taken into consideration are mean stress, stress amplitude and stress rate. Since the study is comparative all the factors need to be identical therefore normalized mean stress and stress amplitudes are used at constant stress rate and homologous temperature is considered to observe the difference in ratcheting behaviour of the alloys. Fractographic studies of the failed specimens were also observed, at room and homologous temperatures with the aid of scanning electron microscope. The difference in fractographic features and deformation mechanism of the alloys has been elaborated. The key results of this investigation points that there is accumulation of plastic strain under asymmetrical cyclic loading. Modified 9 Cr-1Mo steel exhibited unique fracture behaviour under ratcheting which was not observed in case of IN-617 superalloy. On comparing the ratcheting of the alloys at ambient temperature and homologous temperature it was concluded that uniform strain can be considered as an important parameter for selection of materials for piping and tubing components, experiencing ratcheting and Inconel 617 alloy sustained very high strain values compared to modified steel.

Table 1: Ratcheting fatigue test matrix at ambient and homologous (0.42Tm) temperatures.

AMBIENT TEMPERATURE							
Material	**Minimum stress σ_{min} (MPa)**	**Maximum stress σ_{max} (MPa)**	**Stress Amplitude σ_a (MPa)**	**Mean stress σ_m (MPa)**	**Normalized stress amplitude (σ_a/σ_{UTS})**	**Normalized mean stress (σ_m/σ_{UTS})**	**No. of cycles to failure (N_f)**
Modified 9Cr-1Mo steel	-200	620	410	210	410/713= 0.58	210/713=0.29	1506
Inconel 617 alloy	-240	730	485	245	500/835=0.58	250/835=0.29	4206
HOMOLOGOUS TEMPERATURE (0.42T_m)							
Material	**Minimum stress σ_{min} (MPa)**	**Maximum stress σ_{max} (MPa)**	**Stress Amplitude σ_a (MPa)**	**Mean stress σ_m (MPa)**	**Normalized stress amplitude (σ_a/σ_{UTS})**	**Normalized mean stress (σ_m/σ_{UTS})**	**No. of cycles to failure (N_f)**
Modified 9Cr-1Mo steel	-175	365	270	95	270/380 = 0.71	95/380 = 0.25	2894
Inconel 617 alloy	-310	640	473	165	473/665 = 0.71	165/665 = 0.25	2252

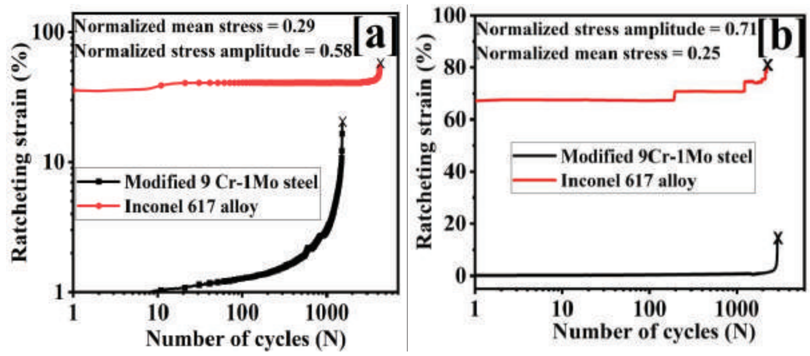


Fig.1 Ratcheting strain plots for modified 9Cr-1Mo steel at (a) ambient temperature (b) homologous temperature (0.42Tm).

Biography

Dr. Prerna Mishra is working as an Assistant Professor in the Department of Mechanical Engineering in MKSSS Cummins College of Engineering for Women, Pune India. She has completed her doctorate from Indian Institute of Technology Varanasi, India in the Department of Metallurgical Engineering. Her area of research is Mechanical Metallurgy. The topic of her Ph.D was Ratcheting fatigue behaviour of Modified 9Cr-1Mo steel and Superalloy Inconel 617. She has in total 12 publications in peer reviewed international journals and 2 book chapters. She attended various national, international conferences and short term courses. She also received an award for best paper presentation in an international conference. She completed her masters in the Department of Metallurgical and Materials Engineering from NIT Rourkela. Her bachelor's degree is in Mechanical Engineering from Uttar Pradesh Technical University.

Design & Development of Hybrid Energy Storage System Incorporating Ultra Capacitors to Prevent Dynamic Electrical Loading

Arpan Dwivedi[1] and **Rupanshu Suhane**[2]

[1]*Mittal Institute of Technology, India*
[2]*Aradhya Biofuels Pvt. Ltd., India*

The concept of hybrid energy storage system (HESS) is introduced in this paper due to the fact that a heterogeneous energy storage system cannot provide reliable long-lasting power to all such loads that undergo dynamic cycles. A dynamic load at the time of start-up draws a large current, such as an induction motor or a DC motor, resulting in accelerated aging of the battery storage system. The use of an ultra capacitor with battery blocks initially meets the sudden energy demands of the dynamic load. In this work, an experimental approach is proposed to derive the benefits of a hybrid energy storage system consisting of an ultra capacitor coupled to a battery to store energy obtained from a stand-alone PV system. Furthermore, the performance of the hybrid energy storage system under three different system loads is tested and verified. A prototype experimental setup including PV module, converter unit, control unit and load is developed. A comparison of the input and output voltage and current curves of the inverter with and without ultra capacitor batteries is shown. The obtained result shows that with the current UC capacity of 3.3Farad at 24V, the percentage reduction in battery drain is almost 20-25% and with an increase in UC capacity, a significant reduction in battery drain can be achieved.

Biography

Dr. Arpan Dwivedi did his B.E. from Electrical & electronics Engineering and M.Tech in Energy Technology from university Institute of Technology, RGPV Bhopal. He awarded PhD in Electrical engineering from Sarvapalli Radhakrishnan University, Bhopal in year 2018. He is currently working as Professor andPrincipal at Mittal Group of Institution, Bhopal, (MP) India. He is having more than 16 years of teaching experience and 10 years of research experience. His research area focuses on Power converter, Renewable energy systems, Hybridization of multiple Energy Sources, Power Systems and Energy systems. He is also having life time membership of ISTE. He has published more than 20 research papers in SCI/Scopus/ UGC indexed Journals and International and national Conference. He had done 3 patents and published 3 books . He is also serving as editor of various repute journals.

Application of DMAIC and SPC to improve operational performance of manufacturing industry: A case study

Lokpriya Gaikwad

SIES Graduate School of Technology, India

Statistical process control (SPC) is an excellent quality assurance tool to improve the quality of manufacture and end-customer satisfaction. It uses process monitoring charts to record the key quality characteristics of the component/ part in manufacture. This research paper elaborates on one such key quality characteristics of the manufacturing of a spring support in the Tissue Dissector Device. This paper presents a creative solution through case study approach for improving the issue of rejection rate in the spring support in a medical device manufacturing industry by using SPC and Six Sigma – DMAIC (define-measure analyze- improve-control) approach which provide breakthrough quality improvements in short period of time. Results showed that the rejection rate before was 0.76% which is after implementation reduced to 0%. Critical to quality cost was 2.67 lacks per annum which was reduced to zero rupees. Hence, combination of Six Sigma tools like DMAIC and SPC, ensure the maximum benefits of reducing critical to quality cost in a manufacturing industry.

Biography

Currently working as an Asst. Professor & NAAC Coordinator in the Mechanical Engineering Department at SIES Graduate School of Technology, Navi Mumbai. He has 20 years of industrial & teaching experience and awarded a Ph.D. (Technology) in the area of Lean, Green, and Six Sigma strategy, at University of Mumbai. He has contributed more than 35 papers at national/international levels at various journals and conferences. He is a fellow member and board member of the international research group. He is also reviewing research papers for reputed International Journals.

ACHIEVEMENTS:

- Professional Awards – 03 (Best Teacher / Best Academician/ Best Researcher)
- Peer Reviewed International Journals – 30
- International Conferences - 11
- National Conferences – 5
- STTP attended – 57
- Books – 05
- Books Chapters – 05
- Reviewer of the Reputed Journal – 25
- Fellowships/ Board member - 05

Artificial Intelligence based identification and detection of fall Armyworm (Spodoptera Frugiperda) for precision agriculture

Srinivasulu Reddy Uyyala[1], M. Mthumitraa[2], Shruthi Sivagnanam[2], K. Thenmozhi[1], Rebecca Mercy Victoria[1] and **S. Nalini[2]**

[1]Machine Learning and Data Analytics Lab, Department of Computer Applications, National Institute of Technology, India
[2]Department of Computer Science and Engineering, University College of Engineering, Anna University, (BITCampus), India

Fall armyworm (FAW) is a destructive bug that attacks maize, millets, vegetables, rice, sugarcane, and sorghum crops. The tropical regions of the planet are the most afflicted by fall armyworm. Early stages of fall armyworm are easier for farmers to cure, lowering the expense and destruction in the crop field. Rapid detection of such insects may boost crop productivity. The detection of fall armyworms in the agricultural field is now possible because to advances in artificial intelligence and deep learning technologies. This study describes in detail the concept and development of a fall armyworm detection system based on the YOLO (You Only Look Once) Family. Experiments were carried out with the YOLOv5, YOLOv7, and YOLOv8 models. According to the findings, training the FAW dataset with YOLOv8 produced the best mAP and F1 Score. Thus, the model trained for detection of fall armyworm with pre-trained model yolov8n.pt, SGD (Stochastic Gradient Descent) optimizer, and 80 epochs produced the best, small (model file size), and accurate model with precision, recall, mAP50, and F1 scores of 0.985, 0.94, 0.976, and 0.962, respectively.

Biography

Dr. U. Srinivasulu Reddy is an Associate Professor in the Department of Computer Applications, National Institute of Technology (NIT), Tiruchirappalli, Tamilnadu, India. His research interest lies in applying various artificial intelligent approaches to extract useful patterns from different facets of societal challenges of high demand with economic benefit. The main aim of his work is to develop machine learning and deep learning models for various domains like agriculture, bioinformatics, banking, telecom, and healthcare. With this motivation, he has established "Machine Learning and Data Analytics Lab" in 2015 and he is a core team member of the Centre of Excellence (CoE) in Artificial Intelligence established in 2020. His research team of 12 doctoral students, 10 post-graduation students are highly motivated and enthusiastic in working out to achieve better outcomes. For his credit, he has produced 9 doctoral till date and 10 post-graduation students annually. He has published more than 64 journal articles & conferences and 3 book chapters. He received "Best Researcher Award" in 2018 & "Best Performer Award" in 2019, 2020 & 2021 from NIT-Tiruchirappalli. Two "Best Paper Awards" in International Conferences. He received a full educational scholarship under "Residential Care Program" from Kindernothilfe (KNH), Germany from schooling to Master's. He received various research grants worth of Rs.127 lakhs from various funding agencies such as Indian Space Research Organization (ISRO), Naval Research Board, Defence Research and Organization (DRDO), Department of Science and Technology (DST) and Department of Electronics & Information Technology (Deity). He conducted many national workshops, conference and training programs. Dr. Reddy has delivered more than 50 invited talks in national and international conferences, workshops, and faculty development programs. He is a life member of the Computer Society of India (CSI), an Annual member of ACM, IEEE, and Analytical Society of India.

Energy efficient decentralized blockchain framework in fog computing

Mahdev Gawas[1] and **Mridini Gawas**[2]

[1]*Directorate of Higher Education, India*
[2]*Goa University, India*

In this research paper, we aim to contribute to the concept of edge computing in IoT-enabled Blockchain. Current IoT-enabled Blockchain frameworks offer some assistance in the simultaneous execution of multiple applications and platform independence. These frameworks rely on Cloud resources for data storage, which often leads to power-limited IoT devices processing raw data, causing management overhead and deteriorating the Quality of Service (QoS) due to centralized approaches. Moreover, these frameworks focus only on a few security aspects, leaving the integrated environment vulnerable. To address these issues, we propose a decentralized blockchain called Energy Efficient and QoS-aware Decentralized Blockchain (EEQA-DBC) in fog computing. The proposed EEQA-DBC eliminates the need for a trusted third party and resolves the problems associated with centralized blockchains. In this paper, we introduce a novel security evaluation authentication scheme that ensures confidentiality, integrity, and availability of data. Additionally, we demonstrate how this scheme effectively counters eavesdropping, replay, and denial-of-service (DoS) attacks, enhancing the overall security of the system.

Biography

Dr. Mahadev Gawas, is a Assistant Professor in Research and Innovation at state higher education council, Directorate of Higher Education, Goa India. He completed Ph.D from the Department of Computer Science & Information Systems, BITS Pilani K K Birla Goa Campus, Goa, India. He received his Bachelor's degree in Computer Engineering from Goa University. He did his Masters degree in Information Technology from Goa University. He has authored a number of research papers in refereed international conferences and journals. His research interests include wireless communications, multimedia communications, cross layer architecture, vehicular ad hoc networks. He has received a number of awards, such as the Asia Pacific Advanced Network Fellowship.

Implementing *In-Situ* multimodal spectroscopy quality control in MEA manufacturing for PEM electrolyzers and fuelcells

Mallikarjuna Rao Motapothula and **Pardha Saradhi Maram**

SRM University AP, India

This report explores the implementation of correlative *in-situ* quality control techniques, including X-ray Fluorescence, Raman spectroscopy, and Impedance spectroscopy, during the manufacturing of Membrane Electrode Assemblies (MEA) for Proton Exchange Membrane (PEM) electrolyzers as well as Fuelcell's to minimize the catalyst loadings as well as improve energy efficiency and long-term operation of MEA's. PEM electrolyzer/Fuelcell play a pivotal role in green hydrogen production/utilization, and MEAs are critical components that directly influence their performance and efficiency. Ensuring the quality and consistency of MEAs is essential to maximize the operational lifespan for more than 25 years, energy efficiency of having more than 90%, and economic viability of PEM electrolyzer systems by minimizing catalyst loadings to 1 g/m^2.

To fulfill the objectives of India's Green Hydrogen Mission, an annual manufacturing capacity of 60-100 GW of PEM electrolyzers is required to produce 5 million metric tons (MMT) of hydrogen annually. This ambitious scale demands approximately 15 tons of platinum (Pt) and 30 tons of IrOx nanoparticles as feedstock, deposited onto a vast 3.8 km2 Nafion membrane. Whereas the global Iridium supply chain itself is around 9 tones per annum as of 2023[1]. State-of-the-art MEAs offer a lifespan of around 13 years, extendable to 25 years through research and development efforts. The MEA's operational life is influenced by material quality, operating conditions, and maintenance.

Developing energy-efficient catalyst coating technology is pivotal for long-term MEA performance. Advanced electrolyzers consume 46-52 kWh of electricity to produce 1 kg of H_2 from 11 liters of high-quality water [2]. Quality of MEA manufacturing significantly impacts electrical energy demand. Deposition techniques such as slot-die and spray-nozzle are being employed for large-scale, efficient production. As catalyst coating areas per stack approach square meters, ensuring uniformity in catalyst loading becomes critical. The implementation of our multimodal *in-situ* quality check platform in MEA manufacturing is indispensable for maintaining consistency.

Biography

He has more than 16 years of R&D experience in India, Singapore, and Sweden. He worked as a beamline scientist at the National Tandem Laboratories in Uppsala University before moving back to India via a prestigious faculty award, the Innovation in Science Pursuit for Inspired Research (INSPIRE) award. He has built customized experimental end stations at accelerator facilities such as the Centre for Ion Beam Applications (CIBA), a world leader in MeV focused ion beams. During his Ph.D. at the National University of Singapore, conducted Ion Channeling studies in ultra-thin crystals like Silicon, Graphene, and oxides. Additionally, He developed real-time spectrometries for energy, environment, and health-related applications at the Singapore-Berkeley Energy Center for over four years.

Sustainable valorization of EAFD for adsorbent, fertilizer, and concrete additive production

M. Alizadeh, M. Abbasi-Riyakhuni and **Z. Pourzal**

Isfahan University of Technology, Iran

Electric Arc Furnace Dust (EAFD), an environmentally hazardous byproduct of the steelmaking industry, with low zinc content was leached with water and acetic acid to remove toxic elements. The washed EAFD was then utilized as an adsorbent for phosphate removal and for the production of ferrous sulfate. Adsorption tests were conducted using aqueous solutions with varying phosphate concentrations in contact with different amounts of EAFD. The results indicated that the prepared adsorbent could adsorb up to 90% of phosphate from a solution with a concentration of 500 ppm. According to Table 1, Since the heavy metal content of the produced ferrous sulfate is low, it can be utilized for various purposes, such as serving as fertilizer for sustainable agriculture. In another approach to immobilize this toxic waste, adding it to the concrete mixture was studied. EAFD was incorporated into Portland cement concrete in different amounts. It was observed that the initial setting time of the concrete specimens was delayed by the addition of EAFD. Furthermore, the addition of 10% by weight EAFD increased the compressive strength of the concrete specimens to 55.1 MPa.

Table 1. *Chemical composition of raw EAFD and ferrous sulfate produced from EAFD after water and acetic acid leaching*

Element (ppm)	Raw EAFD	$FeSO_4$ from EAFD after water and acetic acid leaching
Fe (%)	30.81	15.53
S (%)	0.24	19.49
Al	2628	1325
As	23.3	4.9
Ca	52742	2711
Cd	2	0.6
Co	10.3	5.8
Cr	116	72
Cu	52	197
K	44835	3227
Mg	48500	7634
Mn	2120	1070
Na	78410	1140
Ni	35	20
P	2741	1047
Pb	539	40
Sn	90	48.4
Ti	1110	748
V	1589	418
Zn	6081	2632

Biography

He has a PhD in processes metallurgy Engineering. Currently, He is a faculty member and an associate professor in Materials Engineering Department of Isfahan University of Technology (IUT). An experienced processes metallurgy for over 20 years in Ironmaking and steelmaking and materials recycling techniques. Over 15 years of experience in execution of industrial research projects related to iron and steel production processes such as iron ore pelletizing process, Electric Arc Furnace (EAF), secondary steelmaking, steel continuous casting process and holding workshop course for steel industries.

In-depth investigation of a Novel Schiff Base: Synthesis, spectral analysis, thermal profiling, pharmacokinetic properties, and *In Vitro* biological activities of N,N′-(3,3′- Dimethyl-[1,1′-biphenyl]-4,4′-diyl) bis(1-(2- chloro-phenyl) methanimine)

Jatin D. Patel

Post Graduate Institute of Science and Research Anand, India

This study focuses on synthesizing a novel Schiff base by reacting 2-chlorobenzaldehyde with 3,3′-dimethyl-[1,1′-biphenyl]-4,4′-diamine. Employing a natural acid catalyst and characterizing the compound through X-ray diffraction, Fourier transform infrared spectroscopy, and nuclear magnetic resonance techniques, the research delves into physicochemical properties. Thermal studies, including thermogravimetric and differential thermal analyses, were conducted in a nitrogen environment. Applying isoconversional techniques like Kissinger–Akahira–Sunose, Flynn–Wall–Ozawa, and Friedman, kinetic parameters such as activation energy and Gibb's free energy change were determined. Exploring anti-inflammatory and antidiabetic properties, molecular docking experiments assessed the Schiff base's potential to suppress the amylase enzyme. In addition, using Schiff base is competitive inhibitor which was confirmed by inhibition kinetic. Swiss Absorption, Distribution, Metabolism, Excretion, and Toxicity algorithms were employed for *in silico* analysis, evaluating theoretical pharmacokinetic properties and biological activities. Cytotoxicity tests against human lung cancer cells (A549) revealed significant anticancer properties in the synthesized Schiff base, as demonstrated by the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assay. This comprehensive investigation unveils the multifaceted potential of the synthesized Schiff base, combining experimental and computational approaches for a thorough understanding of its characteristics and applications.

Graphene oxide and its derivatives as electrocatalysts for heavy metal ion detection

Gumpu Manju Bhargavi[1], **Rayappan John Bosco Balaguru**[2] and **R. Karvembu**[3]

[1,3]*Department of Chemistry, National Institute of Technology, India*
[2]*Nano Sensors Lab, Centre for Nanotechnology & Advanced Biomaterials (CeNTAB), SASTRA University, India*

Graphene Oxide (GO) and its derivatives have emerged as a key material in electrochemical sensing, particularly for the detection of heavy metal ions. With its intrinsic oxygen-containing functional groups and two-dimensional structure, graphene oxide provides a suitable platform for a variety of derivatization techniques. These derivatives, such as reduced graphene oxide (rGO) and functionalized graphene, introduce tailored features that have a substantial impact on electrochemical sensing applications.

A redox based electrochemical sensor with electrocatalytic $[Ru(bpy)_3]^{2+}$-GO nanocomposite modified gold working electrode was developed for the simultaneous detection of Hg^{2+}, Pb^{2+}, As^{3+}, Cd^{2+} ions. The metal to ligand charge transfer behaviour and electrocatalytic nature of $[Ru(bpy)_3]^{2+}$-GO nanocomposite favoured the simultaneous detection of target ions. The stable electro-oxidative states in the range of Ru(II) to Ru(III) helped in oxidizing As(III) under controlled pH environment, supported the speciation approach. The performances of the developed sensors including anti-interferent ability were studied and their analytical response characteristics such as detection limit, sensitivity, linear range, response time, repeatability, reproducibility and stability are reported. Towards the detection of mercury ions, piperazine functionalized reduced graphene oxide was employed. The organic heterocyclic piperazine molecule noted on rGO surfaces not only worked as Hg(II) sorbent materials, but also improved rGO solubility and dispersion. The obtained results show that P-rGO modified with SPE has a dynamic linear range, a low detection limit, and high selectivity, and it is capable of detecting Hg(II) ions due to the strong coordination of the nitrogen containing amine functional group with Hg(II) ions.

Not only electrochemical detection, but also a portable electrochemical device was developed using graphene oxide ion selective membrane based flexible electrode for the selective detection of heavy metal ions. This device made the on-site detection easy, and the sensor performance was superior in terms of detection limit and precision.

Biography

Manju Bhargavi Gumpu is a Research Scientist at National Institute of Technology Tiruchirappalli. She published over 31 articles with a cumulative impact factor of 161 and filed a patent. Her current research interests include fabrication and development of nanostructured catalytic materials for electrochemical sensing and energy applications.

Bio-inspired soft robotic grippers: Silicone-based design fabricated through 3D printed moulds

Madhanagopal Manoharan[1], **Saitejas D**[1] and **Perumal Sudalai**[2]

[1]Sathyabama Institute of Science and Technology, India
[2] Karpaga Vinayaga College of Engineering and Technology, India

Soft robotics, inspired by biological systems, has emerged as a promising field for developing versatile and adaptable robotic grippers. In this study, we present the design and fabrication of bio-inspired soft robotic grippers using silicone as the primary material. The gripper structures were realized through the innovative utilization of 3D printed moulds, allowing for precise control over the geometry and compliance of the final device. Drawing inspiration from the biomechanics of living organisms, the gripper's design incorporates features such as compliant fingers and multi-material interfaces to enhance grasping capabilities and object manipulation. The silicone-based construction imparts flexibility and deformability to the gripper, enabling it to conform to a wide range of object shapes and sizes. This bio-mimetic approach not only enhances the gripper's adaptability but also promotes safer human-robot interactions in various applications. The 3D-printed moulds serve as a key element in the fabrication process, offering a customizable and scalable method for producing soft robotic grippers with intricate details. The moulding technique ensures repeatability and ease of prototyping, facilitating rapid iterations in design optimization. Moreover, the silicone material's biocompatibility makes these grippers suitable for applications in delicate environments, such as medical and human-robot collaboration scenarios.

Experimental results demonstrate the effectiveness of the developed soft robotic grippers in gripping and manipulating objects of diverse shapes and materials. The combination of bio-inspired design principles, silicone-based construction, and 3D printed moulds showcases a synergistic approach for advancing the field of soft robotics, opening new avenues for applications in industries ranging from manufacturing to healthcare. This research contributes to the ongoing efforts to create robotic systems that seamlessly integrate into complex and dynamic environments, mimicking the adaptability and functionality observed in nature.

Biography

Madhanagopal Manoharan currently serves as an Assistant Professor (Research) at the Center for Excellence for Additive Manufacturing within Sathyabama Institute of Science and Technology, India, a position he has held since May 2023. Prior to this role, he contributed as a Senior Research Fellow at the Center for Smart Manufacturing in the Indian Institute of Information Technology Design and Manufacturing, Kancheepuram, India. Madhanagopal is on the cusp of completing his PhD in Process Planning for Multi-Axis Additive Manufacturing at IIITDM Kancheepuram, India, showcasing deep expertise in the field with over six years of experience. With a keen focus on additive manufacturing, his research spans areas such as metal additive manufacturing, collaborative robotics, direct energy deposition, and the development of process planning algorithms. Madhanagopal boasts a substantial academic portfolio, featuring more than 15 publications across peer-reviewed international journals, book chapters, and presentations at both international and national conferences. Notably, he was honoured with the Dr. K V Sathyaraj endowment prize and Gold medal by the College of Engineering Guindy, Anna University Chennai in 2014. Furthermore, his contributions have been recognized with best paper awards at various international conferences.

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6th Edition of

Advanced Materials Science World Congress

March 21-22, 2024

A new sustainable approach for biopolymer synthesis in food container packaging materials from coconut coir

Mubarak A. Khan[2], Hafizul Islam[1], Md. Latifur Rahman[2], Tania Akter Ruhane[2] and **Mosummath Hosna Ara[1]**

[1]Khulna University, Bangladesh

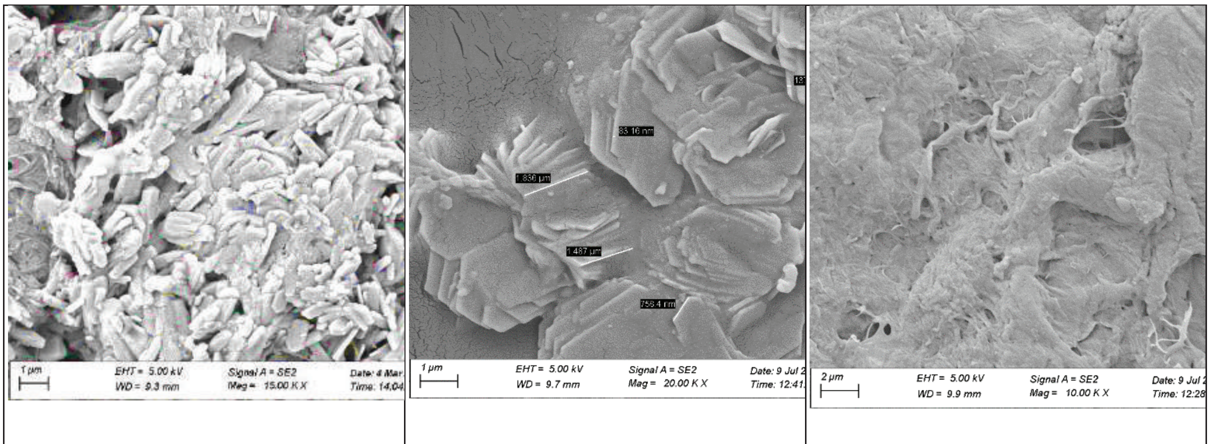
[2]Sonali Bag Project, Bangladesh Jute Mills corporations, Bangladesh

This study focuses on creating sustainable food packaging by synthesizing biopolymer materials from coconut coir cellulose, aiming to replace non-biodegradable single-use plastics. By subjecting coconut coir to alkaline and bleaching treatments, 35% cellulose was extracted. In the biopolymer synthesis phase, potato starch was incorporated as a binder in varying ratios with cellulose, spanning from 1:9 to 10:0. Additionally, Glycerin was introduced as a plasticizer, and citric acid, confirmed by FTIR analysis, acted as a cross-linking agent. Mechanical testing revealed that these bio-based containers with cellulose to starch ratio of 6: 4 displayed remarkable tensile strength (13.21MPa) and elongation (3.7%), outperforming conventional polystyrene polymer (1.5MPa and 2.6%, respectively). SEM micrographs displayed surface alterations in the biopolymer samples, while measurements, including the contact angle (82°), water vapor transmission rate (670 g/m2/d), and TGA, demonstrated enhanced properties such as improved water resistance, water vapor permeability, and thermal stability. Citric acid's presence altered cellulose's chemical structure, significantly elevating thermal stability (>228°C, exceeding 235°C with the cross-linked network structure). Environmental compatibility was assessed through a soil burial test, indicating responsible biodegradation potential. Encouraged by these findings, the study progressed to practical application, successfully manufacturing food containers, including one-time plates and glasses, using an automatic plastic container-making heat press machine. Notably, the inclusion of glycerin as a plasticizer enabled the utilization of existing machinery, eliminating the need for extensive equipment development. In summary, this research offers a sustainable alternative to single-use plastics through biopolymer materials derived from coconut coir cellulose. Additionally, the versatility of coconut coir cellulose-based biopolymers opens doors for applications in various food-related products, contributing to a greener and more sustainable future for the packaging industry. Moreover, this research represents a significant stride towards the transformation of organic waste into valuable biodegradable materials for sustainable food packaging.

Table: The optimization of the cross-linking agent (citric acid) depends on mechanical properties.

Cellulose : Starch- Glycerin	Crosslinker (%)	Tensile Strength (MPa)	Elongation (%)
6:4 – 20%	**10%**	**13.21**	**3.7**
	20%	14.75	2.5
	30%	10.80	2.1
	40%	8.57	1.8
	50%	6.49	1.7
Commercial Poly Styrene - Plate	---------	**1.5**	**2.6**

Figure: Morphological evaluation (SEM) of crosslinking composites



cellulose and starch blended composite	*Glycerin added composite*	*Citric acid added composite*

Biography

Dr. Mubarak Ahmad Khan, former Director General of Atomic Energy Research Establishment, is currently the Scientific Advisor of BJMC, Ministry of Jute and Textiles, Bangladesh. With a PhD in Polymer & Radiation Chemistry, he conducted post-doctoral research in Japan, Canada, UK, and Germany. His expertise spans nanotechnology, materials science, biodegradable polymers, and applied science. He is recognized globally, with numerous awards and honours, including being listed in Who's Who in the World 1998 and selected as a Fellow of IUPAC. He has over 800 publications in international journals, supervised numerous students, holds patents, and has received prestigious national and international accolades.

Significance of natural colorant extracted from Leaves of *Murraya Exotica* and assessment of dyeability on cellulosic fiber *via* statistical modeling

Umme Habibah Siddiqua[1] and **Shaukat Ali**[2]

[1]*University of Jhang, Pakistan*
[2]*University of agriculture faisalabad, Pakistan*

In recent years, increasing awareness of public regarding eco-safety and health matters biodegradable and non-toxic bio-resource products are flourishing in different domains of our lives. This study focussed on the natural colorant extraction from Murraya exotica leaves using Soxhlet extraction apparatus under optimized extraction conditions. The dyeing potential of the colorants obtained from the leaves was evaluated by dyeing cotton fabric at different optimized conditions using response surface methodology (RSM). The maximum dye extraction was observed in 90 min using 1:10 M: L ratio under alkaline conditions using 0.45 M NaOH solution. Data outcomes showed that at optimum dyeing conditions of temperature (62.61ºC), time (75.5 min) and salt (67.89 g/L); highest color buildup of dyed samples was obtained representing 2.21 % K/S values. Different metal salts were applied as mordant to fix the dye on the cotton fabric and excellent color buildup was obtained when copper II sulphate was used as co-mordant. Colorimetric data and color strength of the dyed cellulosic fabric was evaluated by spectra flash spectrophotometer. Furthermore, quality assurance tests such as light fastness, rubbing fastness, washing fastness etc. were conducted which suggested the Marwa plant leaves as a good natural colorant.

Biography

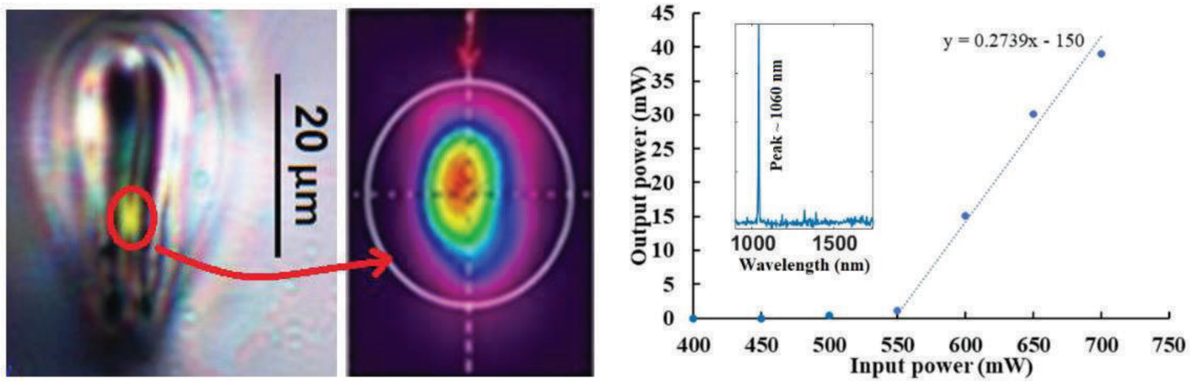
Dr. Umme Habibah Siddiqua completed her doctorate degree in 2017 from University of Agriculture Faisalabad, Pakistan. Currently serving as Assistant professor/ Head of Department in Department of Chemistry, University of Jhang. Her research interests/ expertise includes organic synthesis, waste water treatment, Dye and textile chemistry, Enzyme biotechnology. She has 22 publications with 60+ impact factor in different international journals.

Optimization of femtosecond laser written waveguides in GPGN for efficient lasing in near-IR

M. Khalid and **I. Arshad**

Photonics and Communications lab, Electrical Engineering department, University of Engineering and Technology, Pakistan

The development of low-loss optical waveguides holds paramount significance in the realm of monolithic photonic integrated circuits, enabling efficient light propagation and integration of various components on a single chip. Optical waveguides are integral optical sources for these photonic integrated circuits which are gaining importance in fields such as LiDAR, atmospheric monitoring, optical communication, etc. to count only a few. We present a novel approach to fabricate a high-quality, low propagation loss waveguide in a lead-germanate glass through femtosecond laser inscription. This technique enables short cavity laser operation in the near-IR spectral region. By employing different pulse energies and writing regimes, namely athermal (100 kHz), thermal (5 MHz), and intermediate (1 MHz), a series of waveguides (WGs) were created in the sample to determine the optimal femtosecond laser (FSL) parameter set for inducing superior 3D waveguides in germanate glass with a high refractive index (GPGN). The significant nonlinear refractive index (n2) of GPGN engenders pronounced self-focusing effects in the sample across all FSL repetition rates employed in the study. However, these self-focusing effects, combined with the presence of spherical aberrations caused by the index-matching gel, result in non-uniform guiding structures that adversely affect the propagation losses through the waveguides. Remarkably, the double-line waveguide created with a 1 MHz pulse repetition frequency exhibits the lowest propagation loss of approximately 0.2 dB/cm at 1550 nm. Furthermore, this low-loss waveguide demonstrates the highest laser slope efficiency of 27%, marking a remarkable achievement in germanate glass laser performance. These findings underscore the considerable potential of GPGN glass for efficient lasing applications within the near-IR spectral region.



(a) (b) (c)

Figure 1: (a) Femtosecond laser induced double line WG with low propagation loss of ~ 0.2 dB/cm. (b) 1550 nm beam profile through the low-loss WG. (c) CW WG laser with threshold power ~ 550 nm and laser slope efficiency of 27 %. Inset represents the operating wavelength of the free running CW laser.

Biography

Dr. Mamoona Khalid earned her Bachelor's and Master's degrees in Electrical Engineering from the University of Engineering and Technology (UET), Taxila, Pakistan (BSc: 2004-2008, gold medalist; MSc: 2009-2012). She completed her PhD in Electrical and Information Engineering at the University of South Australia, Adelaide, in 2021, supported by a fully funded University President Scholarship. Her primary research interests lie in Photonics and Optical Communications, focusing on light generation (microchip laser sources), amplification, sensing, and detection through optical fibers, optical waveguides, and free space optics, particularly for near to mid-infrared applications. She also explores ultrafast laser pulse generation, waveguide fabrication using femtosecond lasers, and the design of innovative Photonic Crystal Fibres, as detailed in her profile (https://scholar.google.com/citations?hl=en&user=xwyIwqsAAAAJ). Currently, Dr. Khalid is a Lecturer in the Electrical Engineering Department at UET Taxila and serves as the director of the Photonics and Communications Lab there. (URL: https://fms.uettaxila.edu.pk/Profile/mamoona.khalid).

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Development of hybrid 3D printer filament for fused deposition modeling

Muhammad Yasir and **Adnan Tariq**

University of Wah, Pakistan

This article focuses on the development of a hybrid 3D printer filament for fused deposition modeling (FDM) by incorporating seashell powder and glass fiber into polylactic acid (PLA). A filament extruder was constructed to create different compositions of hybrid filaments, including 8% seashell powder with 92% PLA, 5% seashell with 95% PLA, and 3% seashell with 97% PLA. The objective was to investigate the effects of these compositions on the printability of the resulting filaments.

To evaluate the performance of the hybrid filaments, 3D models were selected as test specimens and printed using the FDM technique. The 3D printer successfully produced the models with the manufactured hybrid filaments. The printed models were then analyzed to assess their quality and dimensional accuracy.

The experimental results demonstrated the feasibility of developing hybrid filaments for FDM using PLA, seashell powder, and glass fiber. The hybrid filaments exhibited suitable characteristics for successful 3D printing, as evidenced by the successful production of the models. The addition of seashell powder and glass fiber did not negatively impact the printability of the filaments.

This article contributes to the exploration of hybrid filaments in enhancing the capabilities of FDM 3D printing technology. The findings provide valuable insights for the development of new materials and offer potential applications in various industries. Further research can focus on optimizing the hybrid filament compositions and exploring additional material combinations to expand the range of properties and applications achievable through FDM 3D printing

Biography

Muhammad Yasir is a distinguished Mechanical Engineer with a stellar career spanning academia, research, and industry. Currently, he serves as the Head of the Department and Assistant Professor at the Mechanical Engineering Department of the University of Wah in Wah Cantt, Pakistan. His teaching prowess shines through in a broad range of courses, from Advanced Manufacturing Processes to Finite Element Analysis.

However, it's his groundbreaking research that truly sets him apart. Specializing in polymer coatings, Yasir's work encompasses formulation, characterization, and mechanical testing, particularly for fire protection applications. He has also ventured into geopolymer topcoats and composite materials, focusing on aerospace applications. Notably, he's a pioneer in hybrid fibers reinforced filament for 3D printing, promising to enhance this technology.

Yasir's industriousness extends to numerous projects, including graphene-reinforced composites and advanced fire protection coatings. His industrial experience at esteemed companies like the Saudi Telecom Company underscores his practical expertise.

Superparamagnetic behaviour of magnetically frustrated rare earth element substituted R-type hexagonal ferrite

I. Sadiq and **S. Riaz**

University of the Punjab, Pakistan

This research article reported the inducement of frustration with the substitution of rare earth elements in already frustrated R-type hexagonal ferrites. Crystallographic X-ray diffraction refinement gave the evidence that all the samples display the single phase hexagonal structure with space group P63/mmc. The lattice parameter varied as concentrations increased. The particle sizes measured from TEM and HR-TEM was found to vary in the range of 10-15 nm. These nanoparticles are spherical in shape and exhibit single magnetic domain. The particle size is an excellent agreement with the crystalline size. VSM results revealed its superparamagnetic nature. This frustration turned the magnetic phase of the material from ferrimagnetic to superparamagnetic. It does not have appreciable magnetic hysteresis loop due to zero coercivity and have a negligible values of remanence and squareness ratio revealed its single magnetic domain. Also the hysteresis loops were fitted theoretically using Langevin function and were in good agreement with experimental results.

Biography

He was working as Assistant Professor in Centre of Excellence in Solid State Physics, University of the Punjab, Lahore, Pakistan. He did Postdoc in Department of Molecular Science and Nanomaterials, Ca Foscari University, Venice, Italy. He has Published more than 50 research paper in peer reviewed International Journals. He has worked as guest editor in “Frontiers in materials” journal. He was involved in teaching and supervising the M.Phil. and Ph.D. students.

Innovations in direct digital manufacturing using multi-material, high-speed 3D printing, and design for additive manufacturing

Muhammad Rizwan ul Haq[1,2]

[1]Department of Design and Manufacturing Engineering (DME), National University of Sciences and Technology (NUST), Pakistan
[2]High-Speed 3D Printing Research Centre, National Taiwan University of Science and Technology, Taiwan

Direct Digital Manufacturing (DDM) incorporated additive manufacturing (AM) capabilities of fabrication of functional parts directly from CAD file with ultimate ease. Unlike rapid prototyping which produces prototypes, DDM uses various AM tools like page-wide printing, multi-material, topology optimization for on-demand, low capital expenditure, unlimited complex design, and innovative products for mass production and customization. Multi-material printing coupled with DDM has opened new horizons for manufacturers to develop a totally new market with minimal risk to time and cost. The upcoming key technology and tools for DDM would be high-speed 3D printing with page-wide technology which is a hybrid process, applied with the concept of design for additive manufacturing and post-processing. Design for additive manufacturing with unlimited design ease enables the user to design innovative cellular lattice structures and intricate geometries. These structures bring superior properties like good strength-to-weight ratio, high surface area, higher load-bearing capacity, excellent shock, and energy absorption compared to solid material with conventional manufacturing. The major challenges of DDM include post-processing 3D printed parts but the NTUST concept of high-speed printing, supportless lattice structure, and ventilated lattice structure easily mitigated this problem. Similarly, 1st ever successful attempt of additively manufactured wave springs has proven its worth for the different industrial applications with superior mechanical properties to other types of springs. The designing of lattice structures with different tessellations and foam filling lattices designs gave the researchers a new direction to design application base end-use components. The foam in the printed cellular as well as the wall thickness of the structure significantly enhances the mechanical properties, particularly energy absorption capabilities which are isotropic in behaviour. Also, research is underway to develop new materials for better printability with improved mechanical properties of 3D manufactured parts. Hence, it is evident that AM will get its boom due to the filling of secondary material inside the cells for a vast variety of industrial applications.

Biography

Dr. Muhammad Rizwan ul Haq currently is an Assistant professor at the National University of Sciences and technology (NUST), Islamabad, Pakistan which is the topmost university in Pakistan. He did his Master's from University of Manchester, UK and worked as lecturer in King Fahd University and Petroleum, Saudi Arabia which is also a top ranked university in Saudia Arabia as well as in top 150 in QS rankings. His recent research is on additive manufacturing of wave springs which has proven superior in mechanical properties than other kinds of mechanical springs. He was also the one who 1st time printed wave spring using additive manufacturing.

Enhanced supercapacitor performance through synergistic synthesis and electrochemical characterization of $NdCrO_3$/GO nanocomposite

Rabia Siddiqui[1], **Malika Rani**[1], **Aqeel Ahmad Shah**[2] and **Aamir Razaq**[3]

[1]*The Women University Multan, Pakistan*
[2]*NED University of Engineering and Technology, Pakistan*
[3]*COMSATS University Islamabad, Pakistan*

This study probes into the synthesis, characterization, and electrochemical prowess of a novel $NdCrO_3$/GO (Neodymium Chromium Oxide/Graphene Oxide) nanocomposite, composed to revolutionize energy storage materials. The nanocomposite was synthesized and characterized. X-ray Diffraction (XRD) confirmed the formation of the composite structure, as evidenced by characteristic $NdCrO_3$ peaks. Scanning Electron Microscopy (SEM) revealed well-dispersed nanoparticles, while Energy Dispersive X-ray Spectroscopy (EDS) revealed the elemental composition—neodymium, chromium, oxygen, and carbon. Fourier Transform Infrared (FTIR) analysis revealed minimal alteration in transmittance peaks between $NdCrO_3$ and the composite, indicating limited chemical changes. The electrochemical assessment encompassed cyclic voltammetry (CV) and galvanostatic charge-discharge (GCD) measurements. Surprisingly, the specific capacitance values for the composite significantly eclipsed pristine $NdCrO_3$, registering 351.2 F/g in CV and 345.14 F/g in GCD, compared to 117.1 F/g and 99.3 F/g, respectively. Electrochemical Impedance Spectroscopy (EIS) fortified these findings with a low equivalent series resistance (ESR) of 1.3 ohm, indicative of favorable charge transfer kinetics. This holistic exploration underscores the successful synthesis and remarkable electrochemical performance of the $NdCrO_3$/GO nanocomposite. The fusion of $NdCrO_3$ and GO not only preserves structural integrity but amplifies electrochemical capabilities, indicating promise for energy storage applications. This composite serves as a bridge between elevated performance and innovative technology in the energy storage realm. The study highlights its novelty and potential to reshape energy storage solutions.

Biography

Rabia Siddiqui, an Associate Professor at Punjab's Higher Education Department, Pakistan, deeply committed to pioneering research. As a devoted Ph.D. Research Scholar at The Women University, Multan, Pakistan, her research revolves around Material Science, with a keen focus on 2D Materials, Nanocomposites, and the intricate synthesis of materials using wet-chemical methods.

Her research portfolio showcases projects involving far-UVC device-based nanomaterials and innovative nanomaterials for energy storage devices. Her Ph.D. endeavors center on the captivating theme of "Electrochemical Performance of 2D Materials/Rare-Earth Element-based Nanocomposites," in perfect alignment with Sustainable Development Goals.

Academically, she hold a Ph.D. in 2D Materials/Nanocomposites, an M.Phil in Solid State Physics, and a Master's in Physics. Her career has spanned roles from Lecturer to Assistant Professor, and she currently serve as an Associate Professor.

Beyond academia, she was an avid learner, actively participating in conferences and workshops to refine Her teaching and learning skills. Proficient in scientific computing and computer applications, she harmonizes her academic pursuits with a love for travel, trekking, reading, and writing. she was also a proud lifetime member of the "Khwarizmi Science Society," connecting me with fellow visionaries in our collective quest to redefine the scientific landscape.

PEERS ALLEY MEDIA

A comprehensive review of synthesis, applications and future prospects for silica nanoparticles (SNPs)

Hafz Anees ur Rehman, Faheem Akhter, Ahsan Atta Rao, Mahmood Nabi Abbasi, Shafeeque Ahmed Wahocho, Mukhtiar Ali Mallah and **Zubair Ahmed Chandio**

Department of chemical Engineering, Quest, Nawabshah, Pakistan

Silica nanoparticles (SNPs) have shown great applicability potential in a number of fields like chemical, biomedical, biotechnology, agriculture, environmental remediation and even wastewater purification. With remarkably instinctive properties like mesoporous structure, high surface area, tunable pore size/diameter, biocompatibility, modifiability and polymeric hybridizability, the SNPs are growing in their applicable potential even further. These particles are shown to be non-toxic in nature, hence safe to be used in biomedical research. Moreover, the molecular mobilizability onto the internal and external surface of the particles makes them excellent carriers for biotic and non-biotic compounds. In this respect, the present study comprehensively reviews the most important and recent applications of SNPs in a number of fields along with synthetic approaches. Moreover, despite versatile contributions, the applicable potential of SNPs is still a tip of the iceberg waiting to be exploited more, hence, the last section of the review presents the future prospects containing only few of the many gaps/ research extensions regarding SNPs that need to be addressed in future work.

Biography

Engr. Anees Rehman graduate as chemical Engineer, Lecturer at Department of chemical Engineering, Quest. phd in progress (Only defense seminar is remained).

In silico investigation of a novel anti-EGFR scFv-IL-24 fusion protein induces apoptosis in malignant cells

Zaroon[1] and **Numan yousaf**[2]

[1]Centre for Applied Molecular Biology, University of the Punjab, Pakistan
[2]Department of Bioscience, COMSAT University Islamabad, Pakistan

Context: Epidermal growth factor receptor (EGFR), a member of the HER receptor family, is over expressed in various cancer cells. Using tumor-specific antibodies to deliver cytotoxic agents directly to the tumour cells is an effective treatment strategy. Targeted therapy by fusing anti- EGFR scFv with tumor-specific cytokines promises the emergence of a new era.

Methods: We designed a novel immuno-apoptotic fusion protein, anti-EGFR scFv-IL-24, consisting of a specific cancer cell targeting antibody and recombinant cytokine IL-24 to explore its anti-cancerous potential. Amino acid sequences of both anti-EGFR scFv and IL-24 were fused using a specific rigid linker. *In silico* characterization of the designed fusion protein like to predict the primary, secondary, physiochemical properties, quality, and structural validation using online bioinformatics tools. The newly designed fusion protein consists of 402 amino acids that showed good quality with a predicted value of 76.7% having 81.5% residues in the most favoured region as predicted by ERRAT2 and Ramachandran plot analysis. Docking and simulation studies were performed using HDOCK and Desmond module of Schrodinger. All the parameters of quality, validity, interaction analysis, and stability suggested that the fused molecule is fully operational and functional. The results of the study support that the anti-EGFR scFv-IL-24 fused protein could be proved as a novel candidate to combat cancer.

Biography

My name is Zaroon and I was born on 10-06-1996 in Sheikhupura. I come from a close-knit family. My parents, Yaqoob Masih and Razia Bibi, instilled in me the values of hard work, perseverance, and kindness from a young age. As I grew older, my thirst for knowledge led me to pursue my education. I attended St. Anthony's High school, where I made lifelong friends and learned the importance of teamwork and friendship. After graduating from high school, I enrolled at Institute of Biochemistry and Biotechnology, University of the Punjab, Pakistan, where I pursued a degree in Biochemistry. College was a time of self-discovery, where I explored new interests, faced academic challenges, and developed a strong sense of independence. The lust of learning brought me to Centre for Applied Molecular Biology, University of the Punjab, Lahore, Pakistan, from where I completed my masters in Molecular biology and Forensic sciences. I want to get a PhD in the relevant field to achieve my goal of becoming a doctor.

Super-dispersive demultiplexer design using a positive-negative refraction boundary and hetero-photonic crystals

Saeed Pahlavan

Tarbiat Modares University, Iran

In this talk, I report a novel approach in optical demultiplexer design by performing wavelength separation in hetero photonic crystals (HPC) with an oblique boundary. In the first step, demultiplexing is done like ordinary demultiplexers by employing wavelength dispersion in photonic crystals. In the second step, contrary to ordinary demultiplexers, the oblique boundary in the HPC changes the components of the Bloch wave vectors of the propagating wave. This effect, if engineered properly, leads to ultra-high separation angles. A beam divergence of 133 degrees is obtained for an incident spectrum of λ= [1521nm, 1550nm].

This design technique can be further improved by inducing a positive-negative refraction boundary in the first crystal. I propose a systematic approach to equi-frequency contour (EFC) engineering to design a photonic crystal with such a boundary to boost the refractive properties of the crystal. Mathematical techniques are employed to turn the EFC engineering process into a mechanical procedure free of trial-and-error steps. The refracted beams in the first crystal impinge on an oblique interface of a second crystal to experience a change in Bloch wavenumbers resulting in even greater refraction angles so that a novel super-dispersive two-step optical demultiplexer is made. A beam divergence of 161 degrees is obtained for an input spectrum of λ= [1474nm, 1550nm].

Biography

Dr. Saeed Pahlavan acquired his PhD from Tarbiat Modares University, Iran working on optical metamaterials based on photonic crystals and their applications in optical communication technologies. He continued to work on vertical-cavity surface-emitting lasers and their numerous applications especially in optical communications as a postdoctoral researcher at TMU. Right now, he is a lecturer and lab admin at TMU. He has published various papers in semiconductor optical amplifiers, optical metamaterials, optical demultiplexers, and vertical-cavity lasers.

The use of urban waste in developed countries using artificial intelligence modeling to evaluate environmental optimization

Hadi Erfani

Islamic Azad University, Iran

Agricultural solid waste (ASW) is a serious concern globally, specifically in agricultural countries like India, China, Japan, Indonesia, Malaysia, etc. A lot of agricultural waste like the remain of crop plants, peels, leaves, corn cob, decayed crops, etc., is produced directly or indirectly every year affecting the environment and is not appropriately managed. Therefore, to overcome this problem, there is a need to develop waste redemption techniques to transform solid waste into value-added products. The wastes are generally rich in carbohydrates, lipids, proteins, and many other organic and inorganic constituents.This composition allows us to produce numerous value-added products like livestock feed, bio-preservatives, biofuels, biofertilizers, single-cell proteins, nanoparticles, biodegradable plastic, chitosan, collagen, and antibodies. Additionally, various start-ups leading to new beneficial products from agricultural solid waste should be promoted. This review intends to explore the sources of agricultural solid waste generation and to provide a solution to manage the waste through modern technologies, saving the environment and boosting a country's economy. The outcome of our study will lead toward a sustainable approach to waste management as we have comprises the most innovative and successful working models in one place. This newly developed technique will help to achieve the greater goal of sustainable development.

Biography

His National Researcher Code is (9833151000034) as well as a Professional Engineer of The Society of Professional Engineers International UK, Top 50 International Distinguished Young Researcher 2020, Top Inventor (Gold Medal) of 2nd Beirut International Innovation Show 2021, Top Inventor (Bronze Medal) of World Youth Invention and Innovation Award 2021, Top Inventor of (Silver, Bronze Medal) of 15th Edition of International Invention and Innovation Show INTARG 2022, International Young Scientist and Keynote Speaker of IRSD 2021. His Research interests are Chemical Engineering, Waste Management, Environment Science, Sustainable Development. his work experience, including Keynote Speaker, Invited Speaker, Plenary Speaker, Guest Lecturer, International Young Scientist, Top Inventor, Research Scholar, Instructor, International Professional Coaching, Best Researcher, Mentor, Industry Professional, Research Assistant, Scientific Committee Member, Organizing Committee Member, Advisory Committee Member, Technical Committee Member, Associate Editor, Editorial Board Member, Reviewer Board Member, International Advisory Board Member. He works as a Reviewer and Editor of the journals with Scopus and ISI Index as well as he was able to work scientifically with more than 50 countries around the world, which was a great honor for me. He has 7 books, 3 translations of book, 2 chapters, 3 inventions, 15 articles.

Water management and importance of intermolecular interactions: Pesticides and fertilizers effect on sprinkler irrigation efficiency

Y. Bahramian[1] and **A. Keneti**[2]

[1]*University of Tehran, Iran*
[2]*University of Tabriz, Iran*

Increasing pressure on water resources in semi-arid regions is forcing farmers to use more effective pressurized water application. Sprinkler irrigation efficiency is directly related to the droplet size which its contributing factors have mostly been studied macroscopically (e.g. nozzle size, flow pressure, etc.). As a result, the importance of microscopic phenomena such as molecular interactions in water drop formation has been overlooked. In this study, the role of surface tension in water atomization has been investigated. Using drop volume method, two conventional surfactants, Hexadecyl trimethyl ammonium bromide (CTAB) and Sodium dodecyl sulfate (SDS), and two commercial fertilizer and pesticide have been employed to investigate the mechanisms via which dissolved materials can affect the water drop size during atomization. Experimental results from this study revealed the commercial fertilizers and pesticides can significantly reduce the surface tension of water and, therefore, size of water droplets (up to 60%). It is also identified that flow rate is a critical factor affecting droplet size when commercial fertilizers and pesticides are present in the system. Furthermore, it was found that fertilizers and pesticides can reduce overall soil water adsorption up to 10%. Consideration of these outcomes in the design of sprinkle irrigation systems can substantially improve water conservation and the environmental sustainability in the areas adversely affected by the global warming.

Biography

With a PhD in Petroleum Engineering, MSc in in Petroleum Exploitation Engineering, and BSc in Mining Exploitation Engineering from the top universities of Iran, Yadollah also have acquired more than 15 years of industrial and research experience in various engineering aspects of the energy sector. As a Researcher and Adjunct Lecturer at the University of Tehran, Yadollah's research area focuses on developing innovative methods to measure the confined fluid density in nanoscopic scale spaces throughout investigation of clay behaviour in order to reduce adverse environmental impacts from the oil and gas industry. The research outcome has been successfully implemented in a start-up project and published throughout several papers and presented at some international conferences.

A new pH and thermosensitive nanocarrier for capecitabine controlled delivery for breast cancer cell

M. Manoochehri and **H. A.Panahi**

Islamic Azad University, Iran

In recent years, different kinds of nanovehicles such as nano particles (NPs), dendrimers, micelles, nanotubes, and liposomes have offered advantages to deliver capecitabine (CAP) into various cancer cells due to specific and small structures leading to enhanced antitumor activity of the routine drugs. Among various nanovehicles, dendrimers have been usually utilized as drug delivery systems (DDS). Dendrimers have unique chemical and physical properties such as low toxicity, good dispersion, easy modification, nano size, globular shape, and biological compatibility. Thermosensitive polymers that change their solubility above or below a particular temperature (Upper Critical Solution Temperature or Lower Critical Solution Temperature, UCST or LCST) are often referred to as smart polymers which can also improve the drug loading rate due to their temperature-sensitivity.

Tungsten disulfide is one of the superior materials with a layered crystal structure similar to that of graphene, and its high specific surface area gives it a high drug loading capacity and it is broadly explored because of its outstanding nontoxic properties, chemical inertness, and structural stability with a high melting point.

Our main aim in our recent study was to develop pH/temperature sensitive nanocarrier based on the tungsten disulfide as a potential delivery platform for sustained release of CAP using NIR laser irradiation. For the first time, a new type of pH/thermosensitive polymer was synthesized with allyl alcohol and N-vinyl caprolactam on the tungsten disulfide surface. The dendrimer was grown from the surface of the modified tungsten disulfide as a nanocarrier to encapsulate the capecitabine.

The novel nanocarrier showed great potential as a pH/temperature sensitive controlled drug delivery system owing to its biocompatibility. Different release kinetics models were carried out to investigate the release curve of CAP from pH/temperature sensitive nanocarrier. The resulting pH/temperature sensitive nanocarrier was evaluated in-vitro cytotoxicity in human normal and breast cancer cells. According to in-vitro drug release experiments, CAP from the developed nanocarrier demonstrated a sustained release curve for six hours. In addition, in-vitro cytotoxicity revealed that CAP loaded nanocarrier at 20 mg L− 1 was highly cytotoxic for MCF 7 cancer cells than for normal cells. Accordingly, CAP loaded nanocarrier (20 mg L− 1) had a greater potential for anti-cancer effects via the NIR laser irradiation and photo-thermal therapy. As a result, the synthesized nanocarrier is a promising candidate for controlled release of capecitabine.

Biography

Dr. Manoochehri received her B.Sc. from Alzahra University in 1991, M.Sc. from Islamic Azad University North Tehran Branch in 1997 and Ph.D. degree in Inorganic Chemistry from Science and Research University, Tehran, Iran in 2002 under the supervision of Dr. H. Aghabozorg. She has been appointed as an Assistant Professor in the Department of Chemistry, Islamic Azad University Central Tehran Branch in 2002and received an Associate degree since 2015. Her current research activity includes synthesis and application of nanocomposites

VIRTUAL EVENT

6th Edition of

Advanced Materials Science World Congress

March 21-22, 2024

Application of pharmaceutical waste as a heterogeneous catalyst in biofuel production

Tahmasebi-Boldaji

University of Isfahan, Arghavan Kimiagaran Nesfejahan Company, Isfahan Science and Technology Town (ISTT), Iran

One of the challenges in the developing world is managing medical and pharmaceutical waste. According to reports, over 3.5 million tons of medical waste products are just produced in the USA, and other developing countries are also accelerating the production of this waste. The development of industries is highly dependent on population growth, which eventually results in higher energy consumption. In addition, high emissions of carbon dioxide worldwide have adverse effects such as climate change. Therefore, replacing petroleum-based fuels with a renewable and environmentally friendly energy source is essential.

Considering the high production volume of pharmaceutical wastes and their disposal methods, this presentation shows that these wastes can be used as a new method in the management of pharmaceutical wastes that are both expensive and cause pollution. The purpose of this presentation is the proper and positive use of pharmaceutical wastes instead of their disposal, which can be introduced as an essential role in biofuel production.

Biography

Ramin Tahmasebi-Boldaji, 32 years old, is a scientific researcher who works in large industrial companies in Iran (Poly Acrylic Iran Company). He is also a shareholder and member of the board of directors of a knowledge-based company in the best science town and technology park in Iran (Isfahan Science and Technology Town (ISTT)).

The Importance of things surface intelligence analysis in defect recognition

Majid Mirbod

Department of Industrial Management Tehran North Branch, Azad University, Iran

As we know, prevention is always better than treatment. Due to the staggering cost of producing products humans need today, their preservation and maintenance have become of importance. In some cases, such as large urban structures that are of general use and are used by many people daily, this matter has become of vital importance. For example, large urban bridges, large commercial centers, urban subways, water supply dam structures of cities, etc. In the automobile industry, thousands of spare parts are produced daily, and it is necessary to ensure their quality to protect passengers' lives. One of the important factors in defect recognition in the mentioned cases is things surface intelligence analysis. I have some research in this regard, which I will discuss in detail: 1-Intelligent Surface Monitoring using Computer Vision and Artificial Neural Networks to achieve concrete monitoring surfaces to increase protection, because changes in the surface are often a sign of a breakdown in objects, online coatings surface evaluation can increase user reliability. I used the Utah State University image dataset that contains over 56,000 images of cracked and non-cracked concrete bridge decks, walls, and pavements. The efficiency of this network is 84.88%. This model will be useful for structural health monitoring and other sensitive surfaces such as aircraft engine shells and train moving rails. 2-Industrial parts change recognition model using machine vision image processing in the framework of industrial information integration to develop industrial parts inspection and improve human visual inspection status to surface change recognition in objects such as cracks, and fractures. 3-Artwork authenticity recognition model using machine vision, image processing, and a fuzzy interface system to surface analyses.

Biography

Majid Mirbod, Industrial Management, PhD from the Department of Industrial Management, Azad University, Tehran North Branch, Iran. Also, he was a lecturer, researcher, journal Reviewer, and industrial engineering author. His research areas are Machine Vision, Change Recognition, Artificial Intelligence, and Fuzzy Interface Systems. He was currently working as a crisis manager in the Tehran Metro Company.

Use of the quantum dot-labeled solid lipid nanoparticles for delivery of streptomycin and hydroxychloroquine: A new therapeutic approach for treatment of intracellular Brucella abortus infection

Seyed Mostafa Hosseini and **Narjes Morovati Moez**

Department of Microbiology, School of Medicine, Hamadan University of Medical Sciences, Iran

Brucellosis is considered one of the most important infectious diseases affecting any tissue and organ in the human body. Due to the intracellular pathogenesis of Brucella species, the use of conventional antibiotics for managing chronic brucellosis has several limitations. Therefore, the study focused on the use of solid lipid nanoparticles (SLN) to deliver streptomycin (STR) for intracellular infection, with or without the combination of hydroxychloroquine (HCQ) to evaluate if there might be a boost in the antibiotic effect when using the STR or STR-NPs alone. We used the double emulsion technique to synthesize Nano drug carriers; afterward, the physicochemical characteristics of synthesized Nano drug carriers were determined. The *in vitro* antibacterial activity of free drugs and Nano drug carriers were evaluated using well diffusion, broth microdilution assays (BMD), and murine macrophage-like cells cell line J774A.1. Additionally, acute and chronic phases of brucellosis were inducted into Wistar rats, and healing capacity of Nano drug carriers on liver and spleen tissues was compared with free drugs. The zeta potential of nanoparticles, means of size, Polydispersity Index (PDI), drugs loading, and encapsulation efficiency were 15.2 mV, 312.5 ± 26 nm, 0.433 ± 0.09, 16.6% and 89.5%, respectively. Well diffusion and BMD methods did not show a significantly differ between free drugs and nano drug carriers. However, the Nano drug carriers remarkably decreased the number of bacteria in the cell line compared to the free drugs. STR/HCQ-SLN enhanced the healing processes of the liver and spleen after brucellosis induction. STR/HCQ-SLN showed better inhibitory effects against the chronic phase of B. abortus infection in comparison to the STR-SLN, but this difference was not statistically significant. Using nanoplatforms to enhance conventional anti-brucellosis agents is promising, green and safe. Due to the continuous release of drugs, drugs increase their accumulation at the site of infection, causing a more significant effect on the chronic and acute phases of brucellosis.

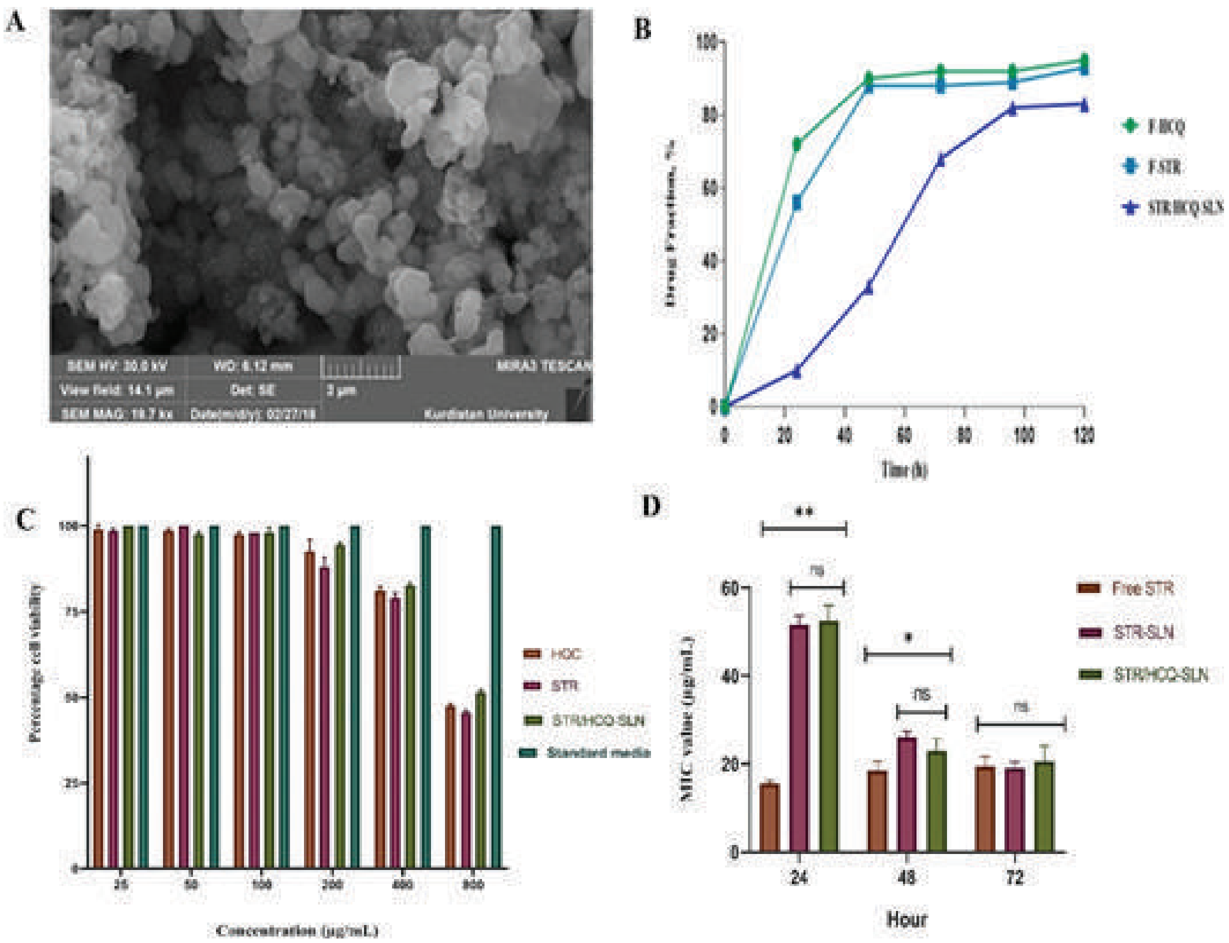


Fig. 1. A) *Streptomycin/hydroxychloroquine-solid lipid nanoparticles field emission scanning electronic microscope image. B) STR and HCQ in vitro release profile from the SLN formulation in pH = 7.4 phosphate buffer (n = 3). Free STR and free HCQ were used as control. C) The effect of free drugs and Nano drug carriers on J774A.1 cells. D) The minimum inhibitory concentration of free STR and STR-HCQ-solid lipid nanoparticles against B. abortus. Free HCQ did not show inhibitory effects against B. abortus. STR: streptomycin. STR/HCQ-SLN: streptomycin- hydroxychloroquine-solid lipid nanoparticles. F-HCQ: free hydroxychloroquine. F-STR: free streptomycin. STR/HCQ-SLN: streptomycin- hydroxychloroquine-solid lipid nanoparticles. Ns: non-significant. *p value < 0.05, **p-value < 0.01.*

VIRTUAL EVENT

6th Edition of

Advanced Materials Science World Congress

March 21-22, 2024

A superconductor model for fundamental particles

M. Javanshiry

Independent Researcher, Iran

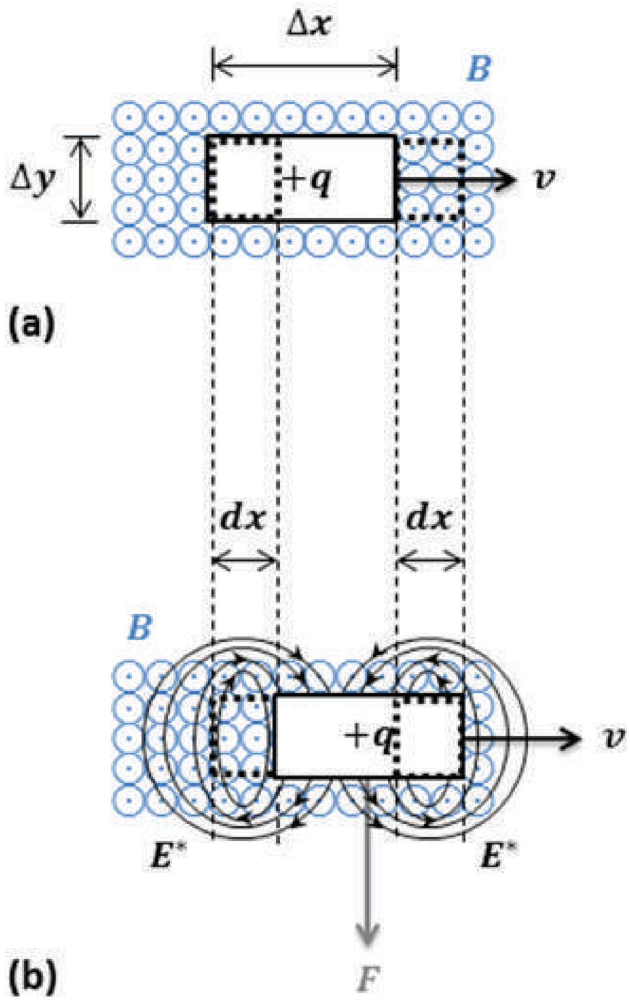
Objectives: It has been nearly 130 years that, in the view of physicists, the definition of the Lorentz force indicates that an external magnetic field exerts force on a moving charged particle. However, it is very possible that this deduction has arisen from a misapprehension according to which any external magnetic field is, intrinsically, capable of exerting force on moving electric charges as a fundamental physics law.

Scope: We demonstrate, however, that the origin of the Lorentz force can be a "local" electric field, rather than a magnetic field, circulating the external magnetic field lines at, respectively, the right- and left-hand sides of the moving particle as it moves through the external magnetic field from left to right. To draw plausible conclusions in this configuration, it suffices to, as an auxiliary assumption, claim that every charged elementary particle of finite size behaves as a superconductive material that nullifies any internal magnetic field as the particle is subjected to any external magnetic field.

Results and Discussion: As it is shown in the figure, a rectangular charged object of $+q$ moves perpendicular to the magnetic field lines. The smaller dotted rectangles inside (left) and outside (right) the object show the infinitesimally small places of a width that are, respectively, left and filled due to the motion of the charge at a time dt in case (b). (b) Some induced electric fields of E^* are produced due to the appearance and vanishing of the magnetic fields at the location of, respectively, the left and right dotted rectangles, yet with the opposite directions. These fields are anticipated to produce a (Lorentz) force of perpendicular to both *V&B..*

Methods: The relevant calculations can easily be done using the Faraday's law of induction or Kelvin-Stokes theorem.

Conclusion: We have shown that if we assume some (super)conducting properties for fundamental particles, the origin of the second term in the Lorentz force formula can arise from a local electric field.



Biography

He successfully passed the Concour (Iranian university entrance exam) of Azad University (private) shortly after messing up a similar exam for public universities, and he graduated with a Bachelor's degree in Civil Engineering, the field in which he was always reluctant to get involved. Indeed, he was devoting 5 to 10 hours a day to his own preliminary studies and research in physics and mathematics so that he frequently did not have enough time to consider his specialized engineering courses. In his early years at the university, he developed a deep suspicion about the correctness of mainstream science methodologies when he understood that many teachers had not been as thorough as he was in analyzing some mathematical and physical problems.

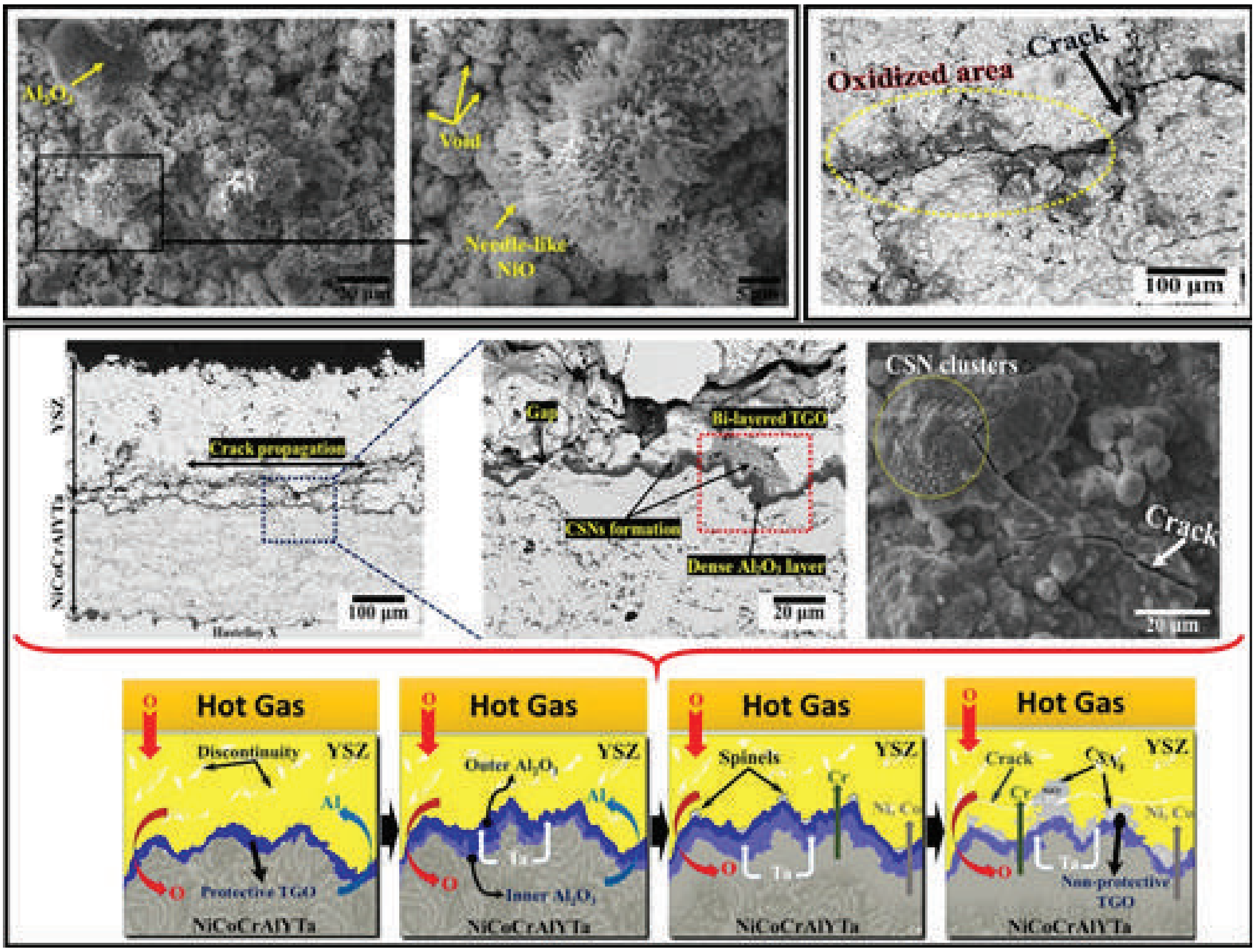
Effect of HVOF processing parameters and particle size on high-temperature properties of NiCoCrAlYTa coatings

Reza Saharkhiz, Zia Valefi, Masoud Mirjani and **Alireza Mirak**

Malek Ashtar University of Technology, Iran

This research investigates the microstructural and high-temperature properties of NiCoCrAlYTa coating deposited by High-Velocity Oxy-Fuel spraying (HVOF) by focusing on the optimization of process parameters and particle size effect. Since the NiCoCrAlYTa powder has a high amount of fine particles (5-38 μm), spraying of these fine particles due to the high surface-to-volume ratio is associated with an increase in particle surface energy, which can lead to in-flight oxidation of particles. To evaluate the oxidation behavior of these particles, the oxygen/fuel ratio, spray distance, powder size, and spraying under shrouded condition was considered as influencing factors. The formation of unmelted particles and in-flight oxidation can strongly be influenced by the oxygen and fuel flows, which determine the velocity of sprayed particles, and the temperature of the jet, respectively. Among the applied coatings, at a constant spraying distance of 300 mm, the sample with an oxygen flow rate of 900 SLPM and a fuel flow rate of 400 ml/min obtained a lower oxide content equal to 11.7%. Different spraying distances can also play a significant role in the final microstructure evolution of the coating. Under constant flow rates of oxygen and fuel, the spraying distance was changed from 300 mm to 250 mm and 350 mm, which resulted in oxide content change from 11.7% to 14.3% and 7.8%, respectively. Under the same spraying condition, increasing the sprayed particle sizes from 5-38 μm to 25-38 μm, the oxide content decreased from 7.8% to 1.8%. It is because smaller particles can expose to higher temperatures and cause them to heat up faster, resulting in more intense in-flight oxidation of the particles. The present study aims to provide a comprehensive understanding of the influence of spraying conditions and particle size distribution on the performance and durability of the NiCoCrAlYTa coating by evaluating the isothermal oxidation, thermal shock behavior, and high-temperature erosion.

Graphical abstract



Palladium nanoparticles-decorated porous metal-organic-framework (Zr)@ guanidine: Novel efficient catalyst in cross-coupling reactions

L. Mohammadi and **M. R. Vaezi**

Department of Nano Technology and Advanced Materials, Materials and Energy Research Center, Iran

A novel heterogeneous Zr-based metal–organic framework (MOF) containing amino group functionalized with nitrogen-rich organic ligand (Guanidine), through a step-by-step post synthesis modification (PSM) approach, was successfully modified by stabilization of Palladium metal nanopartilces on the prepared UiO-66-NH_2 support in order to synthesize the Suzuki- Murray, Mizoroki-Heck, copper-free Sonogashira reactions, and also Carbonylative Sonogashira reaction incorporated of H_2O as a green solvent under mild condition. This newly synthesized highly efficient and reusable UiO-66-NH_2@cyanuric chloride@ guanidine/Pd-NPs reported catalyst has been utilized to increase anchoring palladium onto the substrate in order to alter the structural of the final composite in favour of the progress of the C-C coupling derivatives. Several strategies, comprising XRD, FT-IR, SEM, BET, TEM, TGA, ICP, EDS and elemental mapping analyses, were used to indicate the successful preparation of the UiO-66-NH_2@Cyanuric Chloride@ guanidine / Pd-NPs. In these reactions, the UiO-66-NH_2-supported Pd-NPs illustrated superior performances compared to their catalyst, revealing the benefits of providing nanocatalysts. As a result, the proposed catalyst is favourable in green solvent, also the outputs are accomplished in good to excellent yields. In addition, the suggested catalyst represented very good reusability with no remarkable loss in activity up 9 sequential runs (Figure 1).

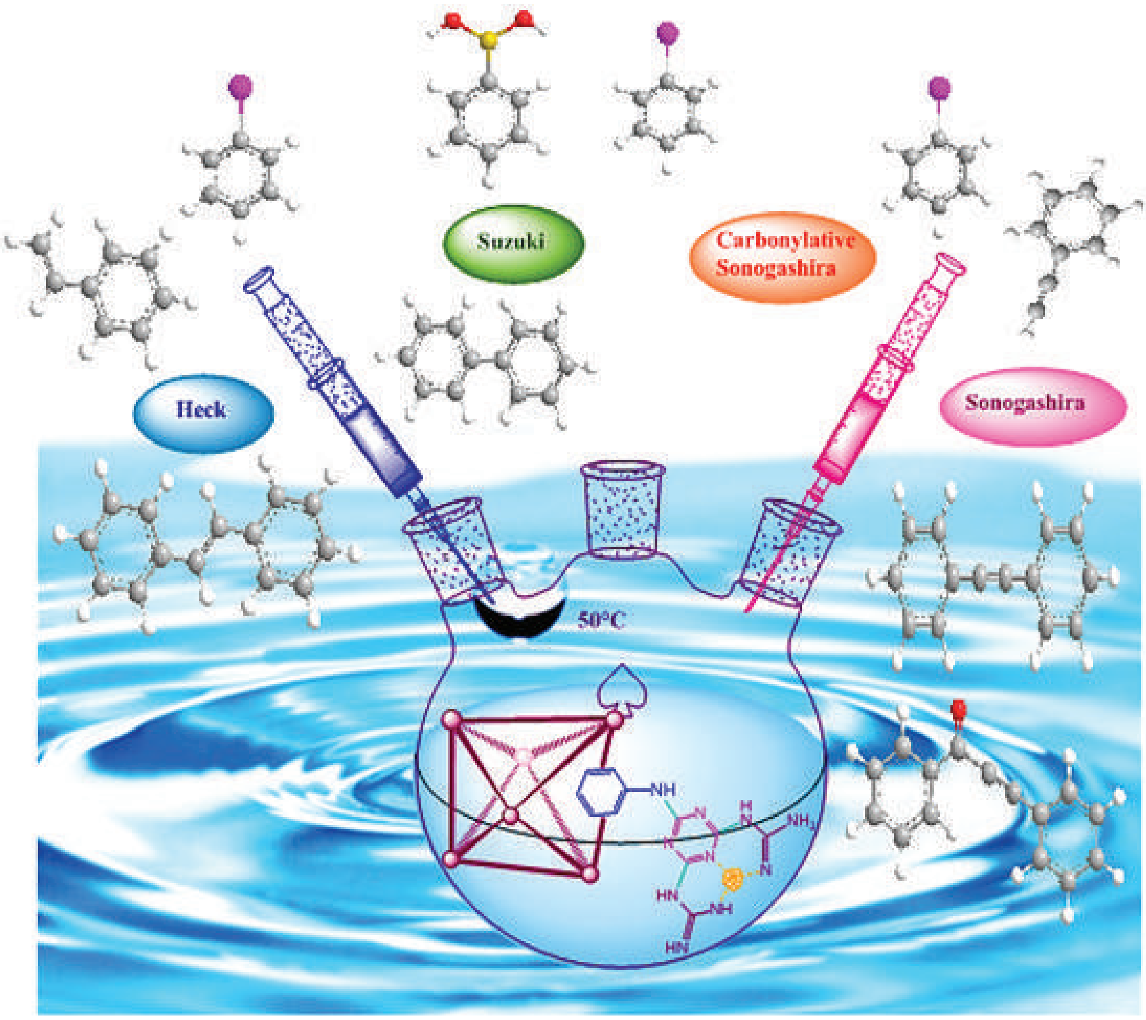


Figure 1. UiO-66-NH2@cyanuric chloride@ guanidine @Pd-NPs.

Biography

Leila Mohammadi was born in Tehran, Iran. she received her Bachelor and M.Sc. degree under the supervision of Dr Sakineh Asghari on the "synthesis of heterocyclic compounds" at the University of Mazandaran (Babolsar). After that, she was received her thesis in organic chemistry as the matter of "synthesis of heterocyclic compounds, catalyst, Metal organic frameworks (MOFs), Nanomaterial, advanced material and nanotechnology" under the supervision of Prof. Dr Majid M. Heravi at Alzahra University, Tehran, Iran in 2021. From 2021 until now, she is working as the Post Doctorial Researcher with the major of advanced material and nanotechnology, Heterocyclic compounds and MOFs, MOF-On-MOF in Department of Nano Technology and Advanced Materials, Materials and Energy Research Center.

Evaluation of Low-Level Laser Therapy in Patients with Complaints of Tinnitus in Kurdistan Region _ Iraq

Ronak Taher Ali, Tara Nooruldeen Abdullah and **Abdulkhaliq K.Emin**

Department of Physiotherapy, Tishk International University, Kurdistan Region - Iraq

Background: Tinnitus is the perception of sound that results exclusively from activities within the nervous system, without any corresponding mechanical or vibratory activity within the cochlea, and is not related to external stimulations of any kind.

Objective: To assess the efficacy of low-level laser therapy (LLLT) in treating patients with long-term tinnitus symptoms.

Methods: LLLT (100 mW and 650nm) was delivered via the Tinnitool device, a self-treatment soft laser device. LLLT was delivered transmeatally for two minutes once a day, for one month. The ages of the patients ranged from 29 to 72 years. All the patients had unilateral or bilateral subjective tinnitus with long-term disease.

Result: This study included 16 ears from 12 individuals (50% men and 50% women). Following LLLT, tinnitus significantly improved ($p < .002$). Of these, 33.3% of the patients reported complete improvement, and 41.6% reported only minor improvement. Additionally, 25% showed no improvement in their tinnitus symptoms.

Conclusion: LLLT was successful in improving tinnitus symptoms.

Biography

Dr. Ronak Taher Ali is Assistant Professor in Hawler Medical University, Collage of Medicine, Kurdistan Region, Iraq of Medical Physics specialty. She finished her M.Sc. in Medical Physics/Audiology at Salahuddin University, Collage of Medicine in 2003 and received her Ph.D. in Medical Physics in 2008 From Collage of Medicine/ University of Al-Mustansaryia, Bagdad. Her research interests in applied work related to (Diagnostic Radiology, Nanomedicine, Radiation Protection, Radiation Oncology, Audiology & Physiotherapy). In particular, she is interested in integrated Medicine with Physics for Medical Students.

An exergoeconomic-based method for forming water quality pyramid and assessing the sustainability of recycling processes

A. Hosseinnejad[1], Y. Saboohi[1], Gh. Zarei[2] and **J. Shayegan[1]**

[1]Sharif University of Technology, Iran
[2]Agriculture Engineering Research Institute, Iran

Recycling is one of the main ways of reducing the consumption of resources (reducing the exergy loss of systems). The economic indices (NPV, IRR, etc.) cannot be used to comprehensively assess the sustainability of the recycling process. For overcoming this challenge, the assessment function of "the saved exergoeconomic cost of production through recycling (ΔExC)" was developed. For investing in line with sustainability, the high-priority flow for recycling must be distinguished from other flows in the system. Water Quality Pyramid (WQP) was presented based on the unit exergoeconomic cost index (c) to prioritize the flows in the system. The developed method was used to assess the sustainablity of the recycling process in a hydroponic greenhouse producing 725,000 roses cut-flowers in one year, by comparing the two processes for recycling the wastewater of the system to obtain the flows from the top of the greenhouse's WQP, including the nutritious feed water and desalinated water flows with the c indices of 1168 and 25 USD/GJ. Results show that recycling the drainage of the feed water (Closed-Fertigation process) with the ΔExC value of +2172 USD/a is the sustainable choice, while the ΔExC value for the second flow is negative (– 964 USD/a).

Biography

A.Hosseinnejad (born October 18, 1987) received his PhD in the development Water and Energy Nexus (Watergy) Model considering water quality pyramid (WQP) at Sharif university of technology (SUT-2022), Tehran. His current research interests focus on the Water-Energy-Food Nexus (WEFN) and new sustainability indices based on quality pyramid theory and using the exergoeconomic analysis and recycling process. Important case study for WEFN analysis is greenhouse and currently he is co-founder and CEO at AFRA.Co knowledge enterprise, which is focused on the development of an intelligent greenhouse based on the integrated model of WEFN. He has some publications and research studies in field of water and energy. He received MSc in energy systems engineering (2010-2012) and BSc in chemical engineering (2006-2010) at SUT.

Optimizing the blending ratio and processing parameters for ternary blends of recycled polypropylene with recycled high and virgin linear low-densities polyethylene

Rzgar Abdalrahman[1], **Hiwa HamaSalih**[2] and **Sarkawt Rostam**[1]

[1]Department of Mechanical Engineering/Production, Sulaimani Polytechnic University, Kurdistan-Iraq
[2]University of Sulaimani, Kurdistan-Iraq

Polypropylene (PP) thermoplastic polymer is applied in fields of life. The discarded PP parts cause a large amount of waste. Recycled polypropylene (rPP) losses its properties and does not provide virgin properties. This study investigates experimentally the effect of adding different ratios of recycled high-density polyethylene (rHDPE) and virgin linear low-density polyethylene (vLLDPE) with different process variables on the rPP's tensile strength. The most significant injection factors of melt temperature, injection pressure, holding pressure, holding time, and cooling time with the ternary blend ratio were proposed with three levels. Also, various compositions of I, II and III with 85/12/3, 85/3/12, and 85/8/7 wt% are considered respectively to the levels of the rPP/rHDPE/vLLDPE blend. Accordingly, 18 experiments are designed based on Taguchi's orthogonal array (OA) of L18. An injection molding die is designed and manufactured to produce tensile test samples. Scanning electron microscopic (SEM) is applied to show the microstructure of the blends. The response data of ultimate tensile stress are transmitted to signal-to-noise ratio (S/N) to facilitate their analysis by analysis of variance (ANOVA). Finally, the optimum set of parameters that provides the optimal blend with the highest ultimate stress of 21.62 MPa was defined. Additionally, according to the P-values respectively, the most significant parameters are holding pressure, injection pressure, and cooling time.

Biography

Rzgar M. Abdalrahman is an assistant professor of the department of Mechanical Engineering, Technical College of Engineering, Sulaimani Polytechnic University, Kurdistan, Iraq. He received his PhD in Mechanical Engineering from the University of Plymouth, UK. His research interests include Engineering materials, composites, plastics recycling, tooling design for composite materials, material machinability, failure and fracture mechanism of materials.

Photodetection enhancement using silver nanoparticles for surface-modified porous silicon in near-infrared range

Mohammed A. Ibrahem and **Sayran A. Abdulgafar**

Department of Physics, University of Duhok, Iraq

This study describes the modification of porous silicon (PS) by depositing commercial Ag powder on its surface and within its pores to improve its physical properties and performance as an NIR photodetector. The incorporation of Ag-nanoparticles (Ag-NPs) into the PS structure increases the energy band gap from 1.74 eV to 2.46 eV and decreases the diffuse reflectance over a broad range of wavelengths. Afterward, NIR photodetectors of both structures are produced. The maximum current is measured at 850 nm for both photodetectors. In addition to a substantial decrease in the dark current of PS-Ag, PS-Ag's photo-excited current is 4.5 times greater than its dark current, whereas PS's photo-excited current is only 1.7 times greater. In addition, the I-V curves are used to determine the photodetector's sensitivity (S) and the current gain (G) at different incident light wavelengths. At wavelengths of 850 nm, the Au/PS-Ag/Au photodetector exhibits a greater sensitivity of 3.26×102 compared to the Au/PS/Au photodetector, which exhibits a sensitivity of 0.83×102. Based on the results, it is clear that modifying the PS with Ag-NPs is a strong candidate for excellent performance as a near-infrared photodetector in commercial photoelectronic device applications.

Biography

Dr. Mohammed A. Ibrahem is a senior researcher at the University of Duhok's Physics Department, and the Dean of the College of Science. He received his Ph.D. from National Taiwan University and Academia Sinica/Research Center of Applied Science. His main research interests centered around designing and developing nanomaterials for renewable energy and optoelectronics applications. His groundbreaking work on nanomaterials for solar cells paved the way for more efficient and cost-effective photovoltaic technologies. His contributions to energy storage materials also held the promise of transforming the landscape of battery technology, making it more sustainable and reliable.

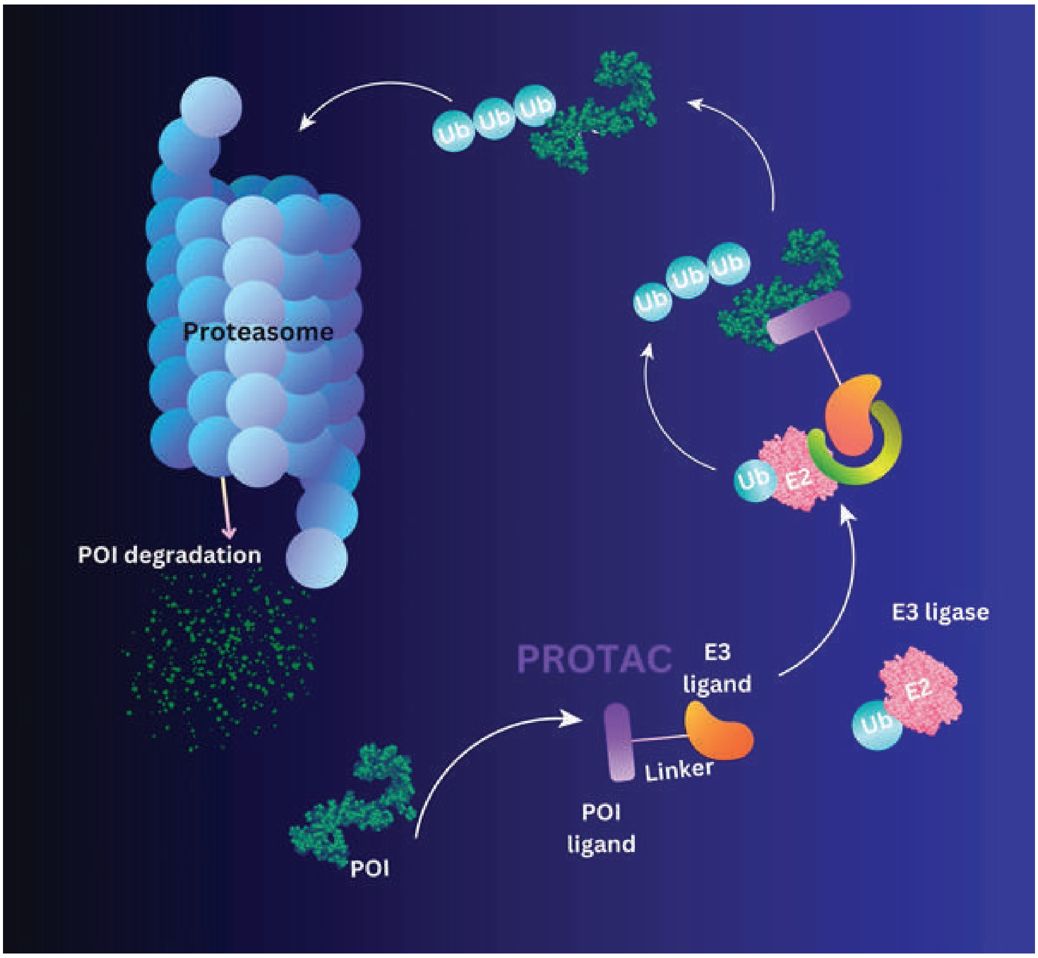
Precision revolution: Targeted protein degradation in cancer and neurodegenerative therapeutics

Hossein Derakhshankhah, Roshanak Amirian and **Zhila Izadi**

Pharmaceutical Sciences Research Center, Health Institute, Kermanshah University of Medical Sciences, Iran

Targeted Protein Degradation (TPD) stands at the forefront of a revolutionary shift in drug design, poised to reshape the therapeutic landscape, particularly in the domains of cancer and neurodegenerative diseases. Diverging from traditional small molecule inhibitors, which often only modulate protein activity, TPD harnesses the cellular machinery to selectively eliminate disease-associated proteins, presenting an unprecedented level of precision and efficacy. At the heart of TPD strategies lies the ubiquitin-proteasome system, a finely tuned cellular apparatus responsible for protein degradation. Two pioneering approaches within TPD are Protacs (Proteolysis Targeting Chimeras) and molecular glues. Protacs function as molecular recruiters, facilitating the binding of target proteins to ubiquitin ligases, thereby marking them for degradation. Molecular glues induce protein-protein interactions that instigate ubiquitination and subsequent degradation. In the context of cancer, TPD demonstrates remarkable potential by addressing challenges inherent in traditional therapies. The capacity to degrade specific oncoproteins implicated in diverse malignancies permits a more tailored and potentially less toxic treatment approach. Additionally, TPD may overcome resistance mechanisms commonly encountered with conventional therapies, presenting a promising avenue for addressing heterogeneous and refractory tumors.

In neurodegenerative diseases, where abnormal protein accumulation is a defining characteristic, TPD emerges as a promising strategy. By targeting disease-associated proteins like misfolded tau or alpha-synuclein for degradation, TPD could mitigate the toxic effects underlying conditions such as Alzheimer's and Parkinson's diseases. The precision of TPD provides hope for slowing or halting disease progression by addressing the root causes at the molecular level. While the frontier of TPD presents ongoing challenges, including issues of selectivity, delivery methods, and potential off-target effects, advances in chemical biology and medicinal chemistry are swiftly overcoming these hurdles, propelling TPD into the forefront of drug discovery.



Biography

Dr. Hossein Derakhshankhah is an Associate Professor at the Pharmaceutical Biomaterials department, School of Pharmacy in the Kermanshah University of Medical Sciences (KUMS). He obtained his Ph.D. in 2017 from Tehran University of Medical Sciences (TUMS), under supervision of Professor Morteza Mahmoudi, on the Nano-Bio Interactions in neurodegenerative disease specially Alzheimer disease. His current research area is in development/design of Nano/Bio materials for treatment of Neurodegenerative Diseases (Alzheimer, Parkinson, etc.) in collaboration with Prof. Mahmoudi's laboratory. Also Derakhshankhah is currently Chief Executive Officer (CEO) of Zistmavad Pharmed knowledge based company.

Environmentally friendly production and characterization of olivine nano-silica for enhancing the compressive strength of self-compacted concrete

Hemn Unis Ahmed[2] and **Rabar H. Faraj**[1]

[1]*Civil Engineering Department, University of Halabja, Iraq*
[2]*Civil Engineering Department, College of Engineering, University of Sulaimani, Iraq*

This study presents the green synthesis and characterization of olivine nano-silica and investigates its influence on the compressive strength of self-compacted concrete (SCC). Olivine nano-silica (ONS), a novel and promising nanomaterial, was prepared using a cost-effective and sustainable method. The synthesized ONS was thoroughly characterized through various analytical techniques, including X-ray diffraction (XRD) and scanning electron microscopy (SEM), to assess its morphology and crystal structure. The effects of incorporating ONS into SCC were evaluated through an experimental investigation. Different proportions of ONS particles (1%, 2%, and 3%) were added to the SCC mixtures to study its impact on the Compressive strength of SCC after 28 and 90 days of curing. Moreover, the effects of ONS particles were compared with the effects of commercial nano-silica (CNS) particles available in the market. The results indicate that the addition of ONS significantly influences compressive strength of SCC positively. At optimized ONS dosage (2%), an enhancement in compressive strength of about 34.8% was observed compared to the reference SCC mixture without ONS. Also, ONS particles resulted in similar even better performance compared to the CNS particles. This research provides valuable insights into the potential use of olivine nano-silica as a sustainable and effective additive for enhancing the mechanical properties of SCC. The findings have significant implications for the construction industry, where the demand for high-performance and environmentally friendly concrete materials continues to grow.

Biography

Rabar H. Faraj received BSc degree in Civil engineering from Duhok University in the Kurdistan region of Iraq, and MSc degree in construction materials from Gaziantep University in turkey, in 2010 and 2015, respectively. He is currently a PhD. Candidate at the Civil Engineering Department, Sulaimani University, and a Lecturer at the University of Halabja. He published about 60 international papers in high-quality journals in the field of construction materials. His research interests include High-performance sustainable materials especially concrete as the main construction material

Hemn Unis Ahmed received BSc degree in Building engineering from Sulaimani University in the Kurdistan region of Iraq, and MSc degree in construction materials from Hasan Kalyoncu University in turkey, in 2010 and 2014, respectively. He is currently a PhD. Candidate at the Civil Engineering Department, Sulaimani University, and a Lecturer at the University of Sulaimani. He published about 56 international papers in high-quality journals in the field of construction materials. His research interests include High-performance sustainable materials especially concrete as the main construction material.

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Enhancing photoluminescence in Eu^{3+} and Er^{3+} activated Y_2O_3 phosphor hosts with Yb^{3+} Co-Dopants through anionic modifiers (BO_3^{3-}, SO_4^{2-}, PO_4^{3-}): Down conversion and up conversion studies

Leelakrishna Reddy

Department of Physics, University of Johannesburg, South Africa

The development of white light emitting diodes (LEDs) involved the incorporation of a blue chip with a yellow-emitting phosphor (YAG: Ce^{3+}) material. This pioneering approach, though advantageous at that time, suffered from some drawbacks such as inadequate color rendering index (CRI) for some of its component colors and a tendency for colors to degrade over time. Researchers worldwide have persistently sought to address this issue, and our research group is no exception. We embarked on a project to craft a single-phased phosphor material capable of yielding colors with a superior CRI, rather than a combination of phosphor materials. Our focus was on enhancing the red and green color components of white light only. To achieve this, we delved into various metal oxides for their suitability and feasibility. Among many semiconducting metal oxides, yttrium oxide (Y_2O_3) stood out as an ideal candidate, due to its impressive chemical and thermal stability, along with its low phonon energy and wide gap energies. The cubic structural nature of yttrium oxide provided a versatile platform for the integration of diverse dopants and anions. Since little to no research was done on Eu^{3+} (red) and Er^{3+} (green) activated Y_2O_3 phosphor materials, our trajectory was with this compound. The incorporation of anions (BO_3^{3-}, SO_4^{2-}, PO_4^{3-}) as modifiers was a crucial step in enhancing the luminescent pathways of these phosphor materials. Furthermore, co-doping with Yb^{3+} ions facilitated efficient energy transfer between dopants, leading to significant enhancements in the quality of red and green color emissions. Such combination would yield white light of a higher CRI.

Biography

Prof. L Reddy, a distinguished scholar, earned his prestigious PhD in Physics from the esteemed University of Johannesburg in South Africa. With a profound expertise in condensed matter physics, he has consistently demonstrated a fervent passion for research and exploration. Initially delving into the magnetic properties of bulk materials, Prof. Reddy has since shifted his focus towards the captivating realm of luminescent properties in phosphor materials. This captivating field opens exciting avenues in diverse applications such as phototherapy, energy storage in battery cells, light-emitting devices, and cutting-edge display lighting systems. As a visionary leader, Prof. Reddy leads a dedicated research team that explores magnetic properties at the nanoscale level, pushing the boundaries of scientific understanding in this domain. His contributions to the scientific community are invaluable, with a prolific publication record in esteemed peer-reviewed journals. Recognized for his expertise, he is frequently invited to deliver keynotes and invited lectures at prestigious conferences worldwide, illuminating current topics in nanotechnology. Prof. Reddy's mentorship has played a pivotal role in nurturing future talent, as he has successfully supervised numerous MSc and PhD students, leaving an enduring impact on the scientific landscape. In South Africa, he is esteemed as an NRF-rated scientist, a testament to his remarkable contributions and dedication to advancing the field of nanotechnology. He envisions nanotechnology as the vanguard of solving contemporary challenges in medicine, health, battery technology, lighting devices, communication technology, and solar cells, making him a catalyst for innovative solutions that benefit humanity.

Adoption of Metal-Organic Frameworks (MOFs)-based Atmospheric Water Harvesting (AWH) Systems in African Countries

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[1]*Department of Mechanical Engineering Science, University of Johannesburg, South Africa*
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The threat of freshwater scarcity on our planet has been complicated by global socio-economic activities and climate changes over time. Provided that the sorbent metal-organic frameworks (MOFs)-based atmospheric water harvesting (AWH) technology holds the potential as a local-focus measure to alleviate such risk by extracting moisture from the atmosphere, its adoption based on the location- and climate-specific conditions shall be further clarified. This work initiates a pivotal step in selecting MOFs sorbent to serve for the AWH demonstration project at different locations in South Africa.

Biography

Jianwei Ren obtained his PhD degree from South China University and Technology, China in the field of Chemical Engineering. He is currently working at University of Johannesburg, South Africa as a full professor and serving as the deputy director of 'Atomic Layer Deposition (ALD) Research Centre'. His research interests cover materials science & manufacturing, H2 & fuel cell technologies, ALD technologies, and system integration. He is the registered professional member of South African Council for Natural Scientific Professions, the Engineering Council of South Africa, the International Society of Electrochemistry, the Royal Society of Chemistry, and rated researcher by the South African National Research Foundation (NRF). He has published over 150 journal articles, 50 conference proceedings, 2 patents, 13 book chapters and presented in over 60 international conferences. Non-scientific interests include sports, history, and travel.

Modification of flexible electrodes for P-type (Nickel Oxide) dye- sensitized solar cell performance based on the cellulose nanofiber film

HF Etefa[1,2], V Kumar[3], FB Dejene[1], MT Efa[2] and **LT Jule[2]**

[1]*Walter Sisulu University (Mthatha Campus), South Africa*
[2]*Dambi Dollo University, Ethiopia*
[3]*The University of the West Indies, Trinidad and Tobago*

The preparation of flexible electrode, including working electrode (WE) and counter electrode (CE), for dye-sensitized solar cells (DSSCs) utilizing metal oxides using environmentally friendly sustainable TEMPO-oxidized cellulose nanofibers (TOCNFs) is reported in this work. A new type of flexible electrode for the DSSCs, which were made of cellulose nanofiber composites with nickel hydroxide [CNF/Ni$(OH)_2$] substrate films and cellulose nanofiber composites with polypyrrole (CNF/PPY). Nickel hydroxide, Ni$(OH)_2$, has been prepared hydrothermally in the presence of TOCNFs, [TOCNF@Ni$(OH)_2$]. Similarly, the conductive polymer substrate has also been prepared from a composite consisting of TOCNF and PPY, TOCNF@ PPY film, by means of polymerization for the CE. Overall, the prepared electrodes both WE from CNF/Ni$(OH)_2$ substrates and CE from the TOCNF@PPY substrate film were revealed as the novelty of this work and which no one has introduced previously. Although NiO nanoparticles (NPs) coated on the Ni $(OH)_2$/TOCNF electrode also produced a good power conversion efficiency, PCE (0.75%); nevertheless, the NiO NP treatment with carbon dots boosted the efficiency up to 1.3%.

Biography

Dr. Habtamu F Etefa is graduated Ph.D. from National Taiwan University of Science and Technology. Presently, he is permanent Postdoctoral researcher at Department of Chemical & Physical Science, Walter Sisulu University, South Africa. Dr. Etefa has supervised 5 postgraduates, 1Co- supervised PhD's students, published 11 research papers, and three books. Dr. Etefa is active reviewer of 2 journals, delivered 5 Invited talks, evaluated 15 external MSc theses and presented 20 conference papers. Dr. Etefa is the recipient of International conference organizing convener award.

In addition, Dr. Etefa made numerous contributions in serving as different E-International Organizing committee, reviewer, as guest editor, and editor for various national and international journals. Organize national and international conference and achieved a lots of awarded.

The use of radio frequency in photocatalysis, progress made and the way forward: Review

Ngonidzashe Masunga[1], **Vijaya S. Vallabhapurapu**[1] and **Bhekie B. Mamba**[1,2]

[1]*University of South Africa, South Africa*
[2]*National Centre for International Joint Research on Membrane Science and Technology, China*

In the search for environmentally clean technology for the effective removal of organic pollutants from water and a clean way of producing hydrogen from water, visible-light-driven photocatalysis has gained a lot of attention. However, the application of this promising technology at the industrial scale has been limited due to the high cost involved, low efficiency, and difficulty in recovering and reusing the photocatalyst. In this review, the impact of radio frequency (RF) on tailoring the physical, optical, and electrochemical properties of the thin film photocatalysts during and after synthesis was discussed. Additionally, the incorporation of RF in a photocatalytic reactor to activate the photocatalyst and as an energy source was explored. The photocatalytic activities of the produced thin films towards organic pollutants in water and hydrogen evolution were discussed. The possibility of recovery and reuse of thin-film photocatalysts, the principles of RF heating, and the advantages and demerits of RF heating were deliberated. Lastly, the gaps that are still open for research and the way RF should be incorporated in photocatalysis to pave the way for the industrial application of this technology were proposed. Overall, the incorporation of RF energy in photocatalysis offers significant opportunities for advancing the field and addressing pressing environmental and energy challenges. Continued research and development in this area will likely yield novel catalyst designs, improved process efficiencies, and expanded applications, ultimately contributing to a more sustainable and cleaner future.

Biography

Dr Ngonidzashe Masunga holds a PhD in Science, Engineering and Technology from the University of South Africa. His PhD project was focused on the development of ternary magnetic nanocomposites to use as photocatalysts, for the removal of organic pollutants in drinking water. Prior to his PhD, he holds a master's degree in chemistry, Honours degree in Chemistry, and BSc Biochemistry and Chemistry from the University of Johannesburg. He is an experienced researcher and teacher who has published nine research articles and mentored several undergraduate and postgraduate students. His research covers the area of use of radio frequency for environmental remediation, photocatalysis, synthesis and characterisation of novel superparamagnetic nanocomposites materials.

Fuzzy logic technique and employment-poverty relationship in MENA countries

Besma Belhadj

University Tunis ElManar, Tunisia

In fuzzy logic, the Gaussian membership function provides a flexible approach to representing degrees of truth within classical sets. Unlike traditional binary classifications, this function acknowledges the inherent complexities and uncertainties by quantifying the degree of membership or truthfulness. Although it is often mistaken for probability, it is crucial to recognize it as a distinct concept.

This chapter aims to utilize the power of Gaussian membership functions in constructing a fuzzy mathematical model for linear regression, surpassing the limitations of conventional approaches. The proposed model reflects the natural behavior observed in real-world phenomena.

To demonstrate its applicability, we examine the intricate relationship between employment and poverty in a group of MENA countries in 2015. By employing Gaussian membership functions, we can capture subtle variations and non-linearities, thus providing a more accurate representation of the relationship between employment and poverty.

This research contributes to the field of fuzzy logic and presents a practical framework for analyzing socio-economic phenomena. The findings are significant for policy-making, as they empower policymakers with a nuanced understanding of the complex dynamics between employment and poverty.

Biography

Besma Belhadj, Full Professor at FSEGT of the University of ElManar. Her research interests are applied statistics, Economic Systems; Microeconomics; Mathematical and Quantitative Methods. She is the author of many research studies published in Empirical Economics, Journal of Quantitative Economics, Swiss Journal of Economics and Statistics, Research in Economics, Economic Modelling, Journal of Intelligent & Fuzzy Systems, Economics Letters, OPSEARCH, Fuzzy Sets and Systems, Soft Computing, Physica A and Review of income and wealth. She is the author of many books in Descriptive Statistics, Mathematical Statistics, Inference Statistics, Probability and Mathematics.

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PEERS ALLEY MEDIA

Preparation, characterization and application of H3PO4-activated carbon from Pentaclethra macrophylla pods for the removal of Cr(VI) in aqueous medium

Tchatchouang Chimi[1], **Boresse U. Hannah**[1], **Nintedem M. Lincold**[1], **Mboumbouo B. Jacques**[1], **Sylvain Tome**[1], **Dzoujo T. Hermann**[1], **Victor O. Shikuku**[2], **Achille Nouga Bissoue**[1], **Gerard Pierre Tchieta**[1] and **François Eya'ane Meva**[3]

[1]*University of Douala, Cameroon*
[2]*Kaimosi Friends University, Kenya*
[3]*University of Douala, Cameroon*

In this work, the effect of acid activation conditions on the textural, structural and adsorptive characteristics of phosphoric acid-activated carbon (AC) prepared from pentaclethra macrophylla pods (PMAC) was examined for the removal of hexavalent chromium from aqueous solution. The precursor and prepared AC were characterized by TGA, FTIR, SEM–EDX, and iodine and methylene blue indices. The TGA curves depicted the presence of hemicellulose, cellulose and lignin confirming the lignocellulosic structure of the precursor. The iodine index (908.60, 911.14 and 955.31 mg/g) and methylene blue index (49.78, 106.36 and 204.12 mg/g) increased with increasing acid:solid ratios (1:1, 2:1 and 3:1) for PMAC1, PMAC2 and PMAC3, denoting increase in microporosity and mesoporosity, respectively. The experimental data were best explained by the Elovich kinetic model and Sips isotherm with maximum adsorption capacities of 438.71, 265.911 and 406.593 mg/g for PMAC1, PMAC2 and PMAC3, respectively. The calculated mean adsorption energies were less than 8 kJ/mol, indicating that the adsorption of Cr(VI) was a physisorption process. Activation ratio of 1:1 had the fastest adsorption rate and largest adsorption capacity for Cr(VI) and is recommended as the optimal synthesis condition.

Eco-friendly solar-driven clay catalysis for mitigating pharmaceutical pollutants in water

M. Ksibi and **F. Mansouri**

Université de Sfax, Tunisia

Managing pharmaceutical pollutants in water is paramount for climate change adaptation and the preservation of aquatic ecosystems. This study investigates the efficacy of natural clays as photoactive materials for the low-concentration degradation of four pharmaceuticals: diclofenac (DIC), ibuprofen (IBU), ketoprofen (KET), and paracetamol (PRC) under solar light irradiation. Various characterizations, including XRD, FT-IR, TG–DSC, and surface area analyses, were conducted to evaluate the clays' properties. Utilizing natural clay and solar energy for photocatalysis reduces reliance on energy-intensive or carbon-emitting water purification methods. This approach effectively removes pharmaceutical pollutants from water, thereby enhancing water quality and safeguarding ecosystems, promoting a more sustainable water cycle. The experiments utilized individual containers with clay ratios ranging from 0% to 40%, combined with precise concentrations of pharmaceutical solutions (10 mg/L to 50 mg/L). These setups were exposed to six hours of sunlight to evaluate natural light's effect on pharmaceutical degradation. Optimal clay dosage for pharmaceuticals degradation was determined at just 10%. The photodegradation sequence of pharmaceuticals under optimal conditions followed this order: KET > DIC > PRC > IBU with 100%, 88%, 85% and 75% of degradation, respectively. Kinetic studies indicated that the photocatalytic process adhered well to the Langmuir–Hinshelwood model. These findings underscore the potential of solar-driven clay catalysis as an eco-friendly solution for water treatment, offering a sustainable approach to mitigate pharmaceutical pollutants.

Biography

Dr. Mohamed Ksibi is a seasoned scholar who earned his Ph.D. in Applied Chemistry in 1993 from the University of Poitiers in France. He has been a Full Professor of Chemistry at Sfax's Higher Institute of Biotechnology (ISBS) in Tunisia since 2009, where he has made substantial contributions to environmental chemistry and sustainability. His research focuses on the elimination and toxicity of persistent organic pollutants in environmental realms, particularly water and soil. Dr. Ksibi is a productive scholar who has co-authored over 110 research papers and 8 book chapters, and his knowledge is demonstrated by co-editing three books on various topics of chemistry and environmental science. Dr. Ksibi is actively involved in many research collaborations, with experts based in Europe, the Mediterranean region, and all over the world. Dr. Ksibi served as Director of the Biotechnology and Health Department from 2008 to 2011 and as Deputy Director from 2011 to 2017. Since 2017, Dr. Ksibi is the General Chairman of the Euro-Mediterranean Conference on Environmental Integration (www.emcei.net), proving his exceptional leadership and managerial qualities on a global scale. In 2023, Stanford University recognised Dr. Ksibi one of the top 2% scientists in the world.

Mobile oscillators in a mobile multi-layer network

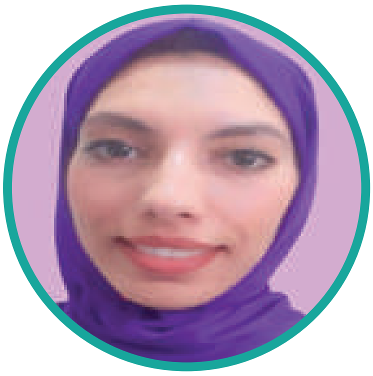
Venceslas Nguefoue M[1], **Steve J. Kongni**[1], **Thierry Njougouo**[2], **Patrick Louodop**[1], **Hilaire Fotsin**[1] and **Hilda A. Cerdeira**[3]

[1]*University of Dschang, Cameroun*
[2]*University of Namur, Belgium*
[3]*Sao Paulo State University, Brazil*

Different behaviors emerging from the unknown have been examined in networks of mobile agents in recent years. This paper introduces the notion of layers relative mobility in space and makes a numerical and analytical study of its influence on the synchronization intra and between layers. The model studied consists of two moving layers, each being a network of mobile oscillators. The movement of the moving oscillators is random in a predefined two-dimensional space, as is that of the layers. The collective behaviors of the entire nodes of both network are studied according to the layer velocity and inter - layers coupling parameters. We then make a comparative study of the results obtained with the model of mobile systems regularly used in the literature and those obtained using the new model proposed by Nguefoue et al. The results show that the emergence of cross-layer synchronization depends only on the distance between the layers. Moreover, this distance causes the synchronization of the oscillators in each layer to emerge. The results also show that the speed at which the layers move has a considerable impact on the synchronization between the layers. We also study the synchronization process and obtained that it's characterized by the formation of the clusters. Whit the master stability function method, the stability of the synchronization is shown in both layers and using the theory of Lyapunov, we found the conditions of the stability of synchronization and demonstrated that it emerges between layers.

Biography

NGUEFOUE MELI Venceslas, a Cameroonian national and doctoral student at the University of Dschang, member of the Cameroon Physical Society (CPS) with the aim of contributing as much as possible to the worldwide influence of Cameroon in the field of education and scientific research. As a lecturer at the University of Dschang, he coordinated several projects under the supervision of his thesis director, which led to the defence of master's theses. He was particularly fond of scientific research and have published a total of 03 articles in quality journals on topical subjects. He was always happy to share his expertise in the field of mobile systems. His aim is to create collaborations that will help us not only to develop new ideas but also to apply the results of our research.



Effect of applied potential on the optical and electrical properties of Cu_2CoO_3

J. Bahar, Y. Lghazi, B. Youbi, M. Ait Himi, C. El Haimer, A. Aynaou, A. Sahlaoui and **I. Bimaghra**

Hassan II University of Casablanca, Morocco

The effect of the applied potential on the crystallography, morphology, optical, and electrical properties of copper–cobalt oxide (Cu_2CoO_3) co-electrodeposited on ITO (Indium Tin Oxide) substrate has been studied. The electrochemical behaviour of Cu_2CoO_3 using cyclic voltammetry showed that the co-electrodeposition of Cu_2CoO_3 occurred at a negative potential of − 0.70 V versus SCE, following a quasi-reversible reaction controlled by the diffusion process. Chronoamperometry (CA) revealed that the nucleation and growth mechanism of Cu_2CoO_3 follows the instantaneous three-dimensional process according to Scharifker and Hill model. X-ray diffraction (XRD) analysis indicated that the resulting layers at different applied potentials exhibited an orthorhombic structure with a preferred orientation of the crystallites (011) plan. The morphology of the surface changes with potential applied. Furthermore, the optical properties of the copper and cobalt oxide films were investigated using UV-visible spectroscopy; showing that the band gap energy for all the materials increases when the applied potential decreases. The Cu_2CoO_3 layers obtained are p-type semiconductors. The acceptor density (NA) increases with decreasing applied potential.

Designing of a quantum TIA to improve FSO signal reception

M. Teuma Mbezi, S. Eke, H.J. I. Som and **M. R. Mouangue**

National Higher Polytechnic School of Douala, Cameroon

Free Space Optic Communication (FSO) is one of the communication systems chosen for 5G + / 6G backhaul. Many works were done to improve signal quality either at emission, transmission channel or at reception through photodetector. The aim of this work is to design a new transimpedance amplifier (TIA) to improve Free Space Optic Communication (FSO) photodetector performance. To achieve our purpose, a negative electrical resistance was introduced into conventional TIA. SPICE software and Kirchhoff's laws were used to design and analyze the circuit. The obtained results show that the new TIA has a better amplitude gain response and lower equivalent noise than conventional TIAs. High bandwidth and flat amplitude response in the pass band characterize our TIA. This characteristic is one of the two criteria for a photodetector to be considered as a quantum device. A 3D gain representation highlights different regions of positive and negative feedback resistors and frequencies to be used or avoided in order to ensure TIA stability.

Biography

Education

Jun 2004 : Secondary School Teacher Diploma at the Higher Teachers Training College of Yaounde 1, Cameroon

Feb 2011 : Master in Physics at the University of Yaounde I, Cameroon

Oct 2018 : Master Engineering in Telecommunications at the National Advanced School of Posts, Telecommunications and I.C.T. , Cameroon

Mai 2019 : PhD in Biophysics at the University of Yaounde I, Cameroon

Sep 2021 - Sep 2023 : PhD student in Telecommunications and Information Systems at the National Higher Polytechnic School of Douala, Cameroon

Professional Experience

Sept 2017-Sept 2023 : Research and Teaching assistant at the Department of Physics, University of Yaoundé 1, Cameroon

Feb 2019-Feb 2022 : Part time university lecture at the professional Master in telecommunication at the University of Dschang, Cameroon

Feb 2005-Sep 2023 : Physics Teacher at Mbot-makat and Ngoa-Ekele High School, Cameroon

The use of raw and modified acacia leaves for adsorptive removal of crystal violet from water

A. Essekri[1], M. Laabd[1], A. Fatni[2], A. Ait Addi[3], R. Lakhmiri[4] and **A. Albourine[1]**

[1]Laboratory of Materials and Environment, Ibn Zohr University, Morocco.
[2]Laboratory of Biotechnology, Materials and Environment, University Ibn Zohr, Morocco
[3]Physical Chemistry and Environment Team, Faculty of Science, Ibn Zohr University, Morocco.
[4]Laboratory of Materials and Resources Valorization, Abdelmalek Essaadi University, Morocco

Water pollution has grown significantly over the last decades and has now developed as a serious worldwide problem. The main focus of this work is the removal of crystal violet (CV) dye from water using acacia leaves (AL) and their modified form by citric acid (AL@CA) as adsorbents. The surface characterization of these materials was studied using SEM-EDS, FTIR, XRD, TGA/DTA, and zeta potential. The analysis demonstrated that AL@CA exhibited an open, irregular, and amorphous structure decorated with oxygen containing functionalities. Furthermore, the AL@CA material is thermally stable up to 260°C. The influence of adsorbent dose, initial dye concentration, temperature, contact time, and pH on the CV dye adsorption performance was studied. The highest CV removal efficiency of 96.4% was obtained at pH ≥ 6. The electrostatic attractions and hydrogen bonds play a pivotal role in boosting CV adsorption. The pseudo-second-order model could very well describe adsorption kinetics. The equilibrium adsorption data followed the Langmuir model. The maximum uptake capacities of AL and AL@CA were 299.70 and 337.83 $mg.g^{-1}$, respectively. The thermodynamic study displayed that the adsorption is endothermic and spontaneous. The regeneration of spent adsorbent revealed that the AL@CA material can be useful until five reuse times.

Biography

- 2020 : National doctorate in fundamental and applied chemistry, chemistry-physics specialty, Faculty of Sciences of Agadir, Ibn Zohr University.
- 2016 : Specialized Master in Water Management and Treatment at the Faculty of Sciences - Ibn Zohr-Agadir University.
- Scientific Publications in International Indexed Journals.Manifestations Scientifiques Internationales.
- Organizations of Scientific Events
- Educational Activities professor of different modules within the university.

Electrochemical properties of Bi_2Se_3 layers semiconductor elaborated by electrodeposition

C. El Haimer, Y. Lghazi, J. Bahar, B. Youbi, M. Ait Himi, A. Aynaou and **I. Bimaghra**

Bio-Geosciences and Materials Engineering Laboratory, Higher Normal School, Hassan II University of Casablanca, Morocco

The semiconductor, Bi_2Se_3 layers was electrochemically deposited on Indium Tin Oxide substrate (ITO) from a nitric acid, Bi $(NO_3)_3 \cdot 5H_2O$ and H_2SeO_3 solution. The results of the electrochemical behavior of Bi_2Se_3 were as follows: Cyclic voltammetry (CV) studies revealed that the electrodeposition of Bi2Se3 was performed at a negative potential of −0.22 V vs SCE, according to a quasi-reversible reaction controlled by the diffusion process. Chronoamperometry (CA) showed that the electrodeposition of Bi_2Se_3 follows a 3D instantaneous nucleation model with diffusion-controlled growth. X-ray diffraction analysis indicated that the resulting layers at −0.22 V vs SCE exhibited a Rhombohedral Bi_2Se_3 structure with a preferred orientation (1 1 3) and the 2:3 stoichiometric ratio of Bi and Se was checked by EDS quantitative analysis. SEM images revealed the formation of a uniform size mainly consisting of nanoparticles with spherical shapes. The Bi2Se3 obtained layers are n-type semiconductors with an optical band gap of 2.35 eV.

Virtual excitations and quantum correlations

R. Hab-arrih[1,2]

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[2]*Label Excellence, Morocco*

We study the effect of Milburn intrinsic decoherence in a system of ultra-strongly coupled quantum harmonic oscillators, putting emphasis on the virtual excitations of the ground state and their interconnection with quantum correlations like entanglement and steering. For isotropic (equal frequency) oscillators we derive an analytic expression for the common steady state value of virtual excitations and then show analytically and numerically that the influence of intrinsic decoherence can be delayed by increasing the ultra-strong coupling. When increasing the anisotropy in the oscillator frequencies, we numerically observe an asymmetric redistribution of virtual excitations among the oscillators, which leads to an asymmetry in quantum steering. Furthermore, virtual excitations are increased, causing also the strengthening of entanglement and steering immediately after their generation. For large anisotropy values we observe quantum synchronization between the oscillators, with both excitations and quantum correlations being significantly enhanced. When increasing the ultra-strong coupling in the case of large anisotropy, a considerable reinforcement of quantum correlations is observed, over long simulation times and in spite of the presence of decoherence. This is the most important result of this work, since it suggests how to properly design the experimental parameters of the system in order to delay the effect of intrinsic decoherence.

CoAl2O4@CoS system for brilliant green degradation under sunlight illumination

Imane El Mrabet[1], **Youssef Fahoul**[2] and **Karim Tanji**[2]

[1]*University of Ibnou Zohr, Morocco*
[2]*Université Sidi Mohamed Ben Abdellah, Morocco*

A cobalt sulphides-supported zinc aluminate spinel system was used as sunlight-light active photocatalyst for the degradation of a model textile dye brilliant green. The material is proven to be competitive for the solar treatment of wastewaters from the textile industry an important source of water pollution worldwide. The system was prepared following a two-step hydrothermal method, showing photon absorption properties across the UV and visible light regions of the solar spectrum. The main responsible species driving the photocatalytic process are proposed, based on degradation experiments using appropriate scavengers. Furthers studies include consideration of operational parameters and cycling experiments to evaluate the stability of the catalyst. The results showed full degradation (100%) based on dye bleaching and >92% mineralization of the dye based on total organic carbon analysis using optimized operational parameters which are a concentration of 20 ppm and catalyst loading of 1 g/l. Our findings point at sulphides-supported spinel materials as promising candidates for advanced solar oxidation technologies for wastewater treatment.

Biography

Imane El Mrabet is a Doctor in Chemistry and engineering processes with many investigations in the catalysis field for wastewater treatment using adsorption, Fenton, and photocatalysis. El Mrabet worked on the development of a new composite based on natural materials for removing contaminants from real waste elements. El Mrabet does research on Moroccan leachate treatment using classical and advanced processes. El Mrabet worked on experimental and theoretical studies of adsorption using different clays.

Photodegradation optimization of methylene green using a novel composite

Karim Tanji[1] and **Imane El Mrabet**[2]

[1]University of Ibnou Zohr, Morocco
[2]Higher School of Technology of Fez, Morocco

This research paper investigates the photodegradation of Methylene Green (MG) using a photocatalyst composite. The objective is to determine the optimal parameters for efficient degradation of MG and assess the performance of the composite in a photocatalytic system. The experimental design involves varying the percentage of Titanium Dioxide (%TiO_2), initial concentration of MG ([MG]), and pH value. A Box-Behnken design methodology is employed to systematically explore the parameter space and determine the optimal conditions. The results indicate that the optimal parameters for effective photodegradation of MG are %TiO_2 (%) = 18.47, [MG] (ppm) = 42.25, and pH = 9.58. Under these conditions, the photocatalyst composite demonstrates high efficiency in degrading MG, resulting in a significant reduction in its concentration. The findings highlight the potential of the composite material for the treatment of MG-contaminated wastewater, offering a promising avenue for the remediation of dye pollutants using photocatalysis

Biography

Karim Tanji is a Doctor in Chemistry and engineering processes with many investigations in the catalysis field for wastewater treatment. Tanji worked on the development of a new composite based on natural materials for removing contaminants from real waste elements. Tanji worked on experimental and theoretical studies of adsorption using different clays.

Polar nano regions in lead free (1-x)(Na0.5Bi0.5)TiO3- x(K0.5Bi0.5)TiO3 relaxors: An impedance spectroscopic study

Mohammed. Mesrar, Amal.Boukili and **Hamza. Mesrar**

Signals, Systems and Components Laboratory (LSSC), Sidi Mohamed Ben Abdellah University, Morocco

In this investigation, (1-x)(Na0.5Bi0.5)TiO3-x(K0.5Bi0.5)TiO3 with (x(%) = 0.0; 12; 16; 20; 30 and 100) calcined at 1000°C for 4h, ceramics were synthesized using a conventional calcination process (solid-state method). The XRD patterns recorded at room temperature proved the phase formation of the samples. Using the Rietveld refinement method which allows us to verify the morphotropic phase boundary (MPB) at x(%)=16-20. The average crystallite size and lattice strain were studied using Scherrer's formula and the Williamson- Hall (W-H) analysis. SEM image analyses provide further evidence of the effect of doping on structural growth in the presence of low temperatures. The relaxation time obtained out of the Z″(f) and M″(f) spectra for (x(%) = 0.0; 12; 16; 20 and 30) tracks the Arrhenius law and indicates the existence of three different relaxation mechanisms with different activation energies. The epaulement response in M″(f) yields an indirect indication of the presence of highly polarizable entities in the samples, which is a signature of the existence of polar nanoregions (PNRs) within the grains.

Biography

He was a Materials Engineer with a passion for pushing the boundaries of materials science to create innovative solutions for real-world challenges. His journey in this field began with a strong foundation in science and mathematics during his early education. As he delved deeper into the world of materials, he became fascinated by their properties and potential applications.

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Modeling of watershed intervention techniques to rehabilitate sediment yield hotspot areas in Hare watershed, rift valley basin, Ethiopia

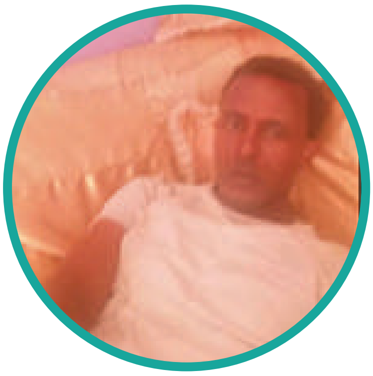
Abebe Temesgen Ayalew

Water Technology Institute, Ethiopia

Soil erosion and sedimentation are broadly recognized as one of the major earth and environmental problems. Increase of agricultural activities, poor farming system, deforestation and overgrazing causing serious soil erosion and sediment yield in the watershed. Modeling watershed management practices play significant role on soil erosion reduction, increase soil moisture content and decrease sediment production. Thus, the main objective of this study was modeling of watershed intervention practices to rehabilitate the soil erosion and sediment hotspot areas. Twenty four suspended sediment samples were collected from Hare River and its concentration was determined in laboratory. The sediment concentration was then converted into sediment load in ton per day and sediment-rating curve was developed. Eighteen years sediment data was generated using developed sediment rating curve. Monthly flow and sediment data calibrated and validated in Soil and Water Assessment Tool-Calibration and Uncertainty Program (SWAT-CUP). Model performance was checked and found very well. Spatial variability map of the sediment yield in the watershed was developed. Twelve sediment hotspots sub-watersheds which produce sediment from high to severe (20.38 to 61.99ton/ha/year) were identified. For those twelve sediment hotspot sub-watersheds, four watershed intervention techniques were applied. After application of strip cropping, residue management, contouring and terracing, sediment production was reduced by 47.42%, 5.54%, 69.22%, and 84.88%, respectively. Among the intervention techniques terracing found to be the most watershed treatment approach in this study. The research finding is vital to environmental protection authority, decision makers and scientific community to undertake intervention techniques for soil erosion hotspot sub-watersheds.

Biography

He was a Hydraulic engineer with background in hydraulic and hydrological modeling, Hydropower engineering and climate impact analysis. He earned his M.Sc. in Hydraulic Engineering (Dec/2017) and B.Sc. in Hydraulic and Water Resources Engineering (June 2014) both from Arba Minch University, Ethiopia. He Joined Arbaminch University as Assistant Lecturer in Sep 2015 and later on from Dec 2017 up to Feb 2022 served as Lecturer position. Now He works as Assistant Professor position.



Analysis of households' willingness to pay for improved solid waste management services in Gondar city, Ethiopia: Evidence from a double bounded dichotomous Contingent Valuation Method

Kassahun Tassie, Anteneh Mulugeta, Yenesew Sewunet and **Getnet Assfaw**

Bahir Dar University, Ethiopia

Waste is a by-product of human life. Nowadays, municipal solid waste is being produced in excessive amounts and in this way, both developing and developed countries are facing challenges regarding generation of waste. Economic development, urbanization and improved living standards in cities have contributed to increase in the amount and complexity of solid waste produced. This study aims to Analysis of households' willingness to pay for improved solid waste management Services in Gondar city, Ethiopia: evidence from a double-bounded dichotomous contingent Valuation Method. A total of 222 randomly selected households were interviewed to address the objective of this study. Finally, the survey result indicated that 192(87.3%) of sample households were willing to pay for improved solid waste management services. Following this, the one and double-bounded dichotomous contingent valuation result revealed that the mean willingness to pay estimated from the Double Bounded dichotomous CVM and open ended formats were 34.48 and 17.0756 ETB[1] per month per households respectively. The total WTP was obtained by adding the WTP of the total households in each stratum, and is equal to 941361ETB and 1900848 ETB for open ended and double bounded format, respectively. Additionally, the bivariate probit model result demonstrated that income and education have positive and significant effects on willingness to pay bid amounts. The results, age, marital status, Bid1 and Bid2 have a negative and significant effect on households' amount of willingness to pay for better solid waste management services. When allocating service charges the city municipality considers amount of solid waste generation and income level of the households. The study results show that when educational status of the households increases and increase their willing to participate in planned improved solid waste management service. Thus, awareness creation is importance for better solid waste management. Additionally the city municipality facilitates a learning media for uneducated households to come up with at least secondary education level.

Biography

Kassahun Tassie Wegedie holds a bachelor's degree in Economics from Mekelle University, Ethiopiain, obtained July, 2010. After this, he worked in different agriculture and trade development and regulation offices in the Amhara National Region State. After gaining two years' of experience he received a scholarship to study at Bahir Dar University, where he earned a master's degree in development economics in October, 2016. Since 2016, he has been part of the Department of Agricultural Economics in CAES at Bahir Dar University. Kassahun has obtained several certificates including Education Quality Auditors (HERQA, 2019); E- learning Approaches (Belgium, 2019); Effective Teaching Skill (Jhpiego, Ethiopia, 2018); Higher Diploma Program (BDU, 2018); Pact with Africa (HSWT, Germany, 2023) and others. As a lecturer, he has taught various courses such as Economics, Project planning, operational research, finance economic policy analysis and other related subjects for many years. Additionally, he has served as the head of education quality enhancement and audit at CAES, Bahir Dar University as well as the coordinator of agricultural economics students for past three years. Currently, Kassahun is responsible for chairing the teaching and learning activities at the same university. He is passionate about actively participating research and outreach activities related to environment, economics, development management, policy analysis in addition to his academic responsibilities. He has also attended numerous national and international short trainings, conferences and workshops on education quality, curriculum design and review, and research issues. Kassahun has a keen interest in work in the areas of economic valuation, food security, livelihood analysis, impact analysis, choice experiments, poverty analysis and determinants of adoption. He aspires to collaborate with experts and institutions that focus on community development activities, particularly in higher education.

MULTI-objective optimization by genetic algorithm of cutting parameters for CNC dry turning of aisi d3 tool steel

Moera Gutu Jiru[1], **Korme Wedajo Likasa**[2] and **Kinisa Wareso Abesho**[2]

[1]*Adama Science and Technology University, Ethiopia*
[2]*Department of Mechanical Engineering, Bule Hora University, Ethiopia*

Achieving the desired surface finish, extending tool life, and increasing productivity are challenges facing the machining industry. In this study, a multi-objective optimization technique was used to perform parametric optimization of the turning process. Regression models were constructed to predict how cutting parameters (spindle speed, feed rate, and depth of cut) affect output response variables such as surface roughness, material removal rate, and flank tool wear. The findings showed that feed rate contributed 95% that it was the most significant parameter affecting surface roughness. Minimum surface roughness of 0.6 μm was achieved at lowest value of cutting parameters speed of and maximum surface roughness of 6.52 μm were achieved at highest value of cutting parameters. Feed rate had a significant effect on the material removal rate (37.78%), followed by depth of cut and cutting speed at percentages of contribution of 32.22% and 14.56% respectively. The highest temperature (56 °C) was observed for higher cutting parameters and the lowest temperature (37 °C) for lower cutting parameters. A maximum flank tool wear of 83.25 μm was achieved at highest cutting parameters, and a minimum flank tool wear of 7.98 μm was achieved at lowest cutting parameters.

An economic approach to analyzing rare-earth elements using an enhanced X-ray fluorescence spectrometer

P.J. Adeti[1], **G. Amoako**[1], **J.B. Tandoh**[2], **O. Gyampo**[2], **H. Ahiamadjie**[2], **A.S.K. Amable**[3] and **S.A Bamford**[4]

[1]*Physics Department, University of Cape Coast, Ghana*
[2]*Ghana Atomic Energy Commission, Ghana*
[3]*University of Health and Allied Sciences, Department of Basic Sciences, Ghana*
[4]*Graduate School of Nuclear and Allied Sciences, University of Ghana, Ghana*

Rare-earth elements (REEs) are pivotal in various industries due to their unique magnetic, luminescent, and catalytic properties. These elements find applications in sectors such as clean energy, automotive, consumer electronics, semiconductors, and nuclear defence.

While REEs are invaluable for geological dating techniques like Sm-Nd isotope geochronology, the conventional analysis method via inductively coupled mass spectrometer (ICP-MS) is expensive, complex, and not readily available, especially in developing regions.

Addressing this challenge, our study harnesses the power of the conventional Tube-based X-ray fluorescence spectrometer, enhancing its capabilities for a cost-effective analysis of REEs. Integrating an Am-241 excitation system into the Ag-anode-X-ray tube spectrometer

(EXP-1) at the National Nuclear Research Institute of the Ghana Atomic Energy Commission improved the detection range and sensitivity. The enhanced system successfully quantified various REEs using their K-X-rays. This method, which was anchored on the "Elemental Sensitivities Method" from the Quantitative X-ray Analysis (QXAS) software, was further cross-validated with Instrumental Neutron Activation Analysis and ICP-MS. Notably, the modified spectrometer showcased an accuracy rate of about 80% when analyzing the REEs in the IAEA-Soil 7 reference material, signaling its potential as a viable, economical alternative for REE analysis.

Biography

Dr. Prince James Adeti is a Physicist with a research interest in environmental and health issues. He has over a decade of experience in research into the areas of rare earth elements, heavy metals, and air monitoring. He had his M.Phil. from the University of Ghana and Ph.D. from the University of Cape Coast, Ghana. He served as the Vice president of the Graduate Students' Association of Ghana-Legon and served as a member of the Graduate School Board of the University of Ghana. A member of the Ghana Science Association. He is currently a Chief Technologist at Ghana Atomic Energy Commission (GAEC)

Mercury releases from artisanal and small-scale gold mining facilities and their potential harmful effects on farm ecosystems — A case study of Obuasi, Ghana

Sylvester Addai-Arhin[1,4], HuiHo Jeong[1], Nana Hirota[1], Yasuhiro Ishibashi[1], Hideki Shiratsuchi[1] and **Koji Arizono[1,3]**

[1]*Prefectural University of Kumamoto, Japan*
[2]*Kumamoto University, Japan*
[3]*Kumasi Technical University, Ghana*

This study examined the degree of mercury (Hg) contamination and its potential harmful effects on the ecosystems, particularly farm ecosystems located near Artisanal and Small-scale Gold Mining (ASGM) facilities around Obuasi, Ghana. Soil samples and staple food crops (plantains and cassavas) were sampled from three farms in each of the ASGM community. The Hg levels in these samples were determined, and the degree of contamination of the samples and the entire ecosystems as well as their associated ecological risks were evaluated using the Hakanson, (1980) model. All the samples had some degree of contamination ranging from low (≤ 5) to very high (≥ 20). This corresponded to monomial ecological risk (M_{er}) of samples ranging from very low risk (≤ 40) to very high risk (≥ 320), and potential ecological risk (P_{er}) of the farm ecosystems also ranging from considerable risk ($300 < P_{er} \leq 600$) to very high risk (> 600). This suggests that the biotic and the abiotic components of the farm ecosystems, particularly farms from Odumase and Tweapease are at greater ecological risks from Hg releases from the ASGM facilities. Therefore, there is the need for strict control and monitoring of ASGM activities within the catchment areas and other areas involve in ASGM operations.

Biography

Dr. Sylvester Addai-Arhin is a young researcher and faculty member of the Faculty of Health Sciences, Kumasi Technical University, Kumasi, Ghana. He has been in Academia for sixteen (16) years i.e., ten (10) years as a technical staff and six (6) years as a lecturer and researcher. He holds a Doctor of Philosophy (PhD) in Environmental Science from the Prefectural University of Kumamoto, Kumamoto, Japan. His research area involves environmental and pharmaceutical contaminants, particularly heavy metals with special interest in mercury risks and toxicity. His specific research interest, therefore, focuses on risk assessment of chemical pollutants, ecotoxicology, analytical method development and validation, and pharmaceutical analysis. His current research works have centered on ecological and human health risks of mercury, particularly mercury from Artisanal and Small-scale Gold Mining (ASGM) facilities.

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Unpacking the gendered interactions and relationship among students in male dominated programs: Perspectives of female students in mechanical engineering in Ghana

Enoch Boafo Amponsah[1], **Emmanuella Asabea Twum**[2], **Jeremiah Teye Laweh**[2], **Eric Agyemang**[2] and **John Boulard Forkuor**[2]

[1]*Rutgers University*
[2]*Kwame Nkrumah University of Science and Technology (KNUST), Ghana*

Growing evidence has underscored the importance of female students' relationships and interactions in Science, Technology, Engineering, and Mathematics (STEM) programs as crucial factors influencing their thriving within these programs. However, the discourse has seen a dearth of literature, especially in low-middle-income countries where deep-rooted cultural norms and values may complicate female students' interactions and relationships with their peers (male students and female colleagues). Drawing on a phenomenological approach, we engaged female students in Mechanical Engineering at a Ghanaian university to share their experiences studying in such a hardcore male-dominated space with a focus on how they interact and relate with their peers. Data from participants were analyzed thematically using NVivo. Female students who participated in the study revealed that the daily interactions with their peers reinforced gendered norms, illuminating male students' superiority in the program. Female students further asserted that the support from their male counterparts influenced their apathetic attitudes towards their female colleagues because they felt they had nothing to offer them academically, financially, and socially in the program. We argue the need to alter the perception of female students and promote a sense of relationship among them through seminars and support from women in STEM occupations.

Biography

Enoch Boafo Amponsah is a PhD student at the School of Social Work, Rutgers University. His research interest and publications involve interpersonal violence and child maltreatment prevention, gender inequality in education. Prior to joining Rutgers, he obtained his masters in Evidence-Based Social Intervention and Policy Evaluation at the University of Oxford, UK.

Plant performance under agro-photovoltaic (APV) system: A detailed investigation of microclimate and crop growth and yield under APV systems in the University of Nigeria, Nsukka

Michael I. Uguru

Dept. of Crop Science, University of Nigeria, Nigeria

Green technology describes the use of technology and science for the development of ecologically friendly goods and services. In many developing nations that are clearly struggling with food and energy shortages, this technology offers enormous potential for crop agriculture and the production of electricity. Crop production is integrated under photovoltaic (PV) panels in the new green technology known as agro-photovoltaics (APV). Under optimum environmental circumstances, APV creates electricity for powering appliances while still producing a sizable agricultural yield. The technology also aids in addressing other local environmental risks, such as the creation of organic composts from biodegradable garbage for use in growing crops beneath PV panels. The University of Nigeria, Nsukka is conducting APV research to examine the performances of both arable crops (Mungbean, Cowpea and Soybean) and horticultural crops (Lettuce, Pepper and Tomatoes) under wet and dry seasons, in collaboration with the Institute of Bio-and Geosciences (IBG-2), Julich, Germany. Presently, investigations have been done on mungbean and lettuce. PV shading decreased mean daily photosynthetic active radiation and leaf temperature, but increased atmospheric humidity of the plants. Growth traits of mungbean were significantly improved by APV system but did not translate into improved grain yield. Lettuce above ground biomass yield recorded non-significant increase under PV panels than the control (open field). The overall results obtained have shown strong indications that APV has huge potentials in addressing the food and energy needs of the poor resource farmers in Nigeria.

Biography

Michael I. Uguru is a professor of Plant Breeding, Genetics and Biotechnology in the University of Nigeria, Nsukka, Nigeria. He was born on December 22, 1956 in Umunede, Delta state, Nigeria. He obtained the Bachelor of Agriculture Degree (FIRST CLASS HONOURS) in 1984, Master of Science Degree in 1987, PGDip in Irrigation Engineering in Katholieke Universiteit, Leuven, Belgium in 1988 and a PhD degree in the University of Nigeria, Nsuka in 1990.

Prof. Uguru has research and teaching experience of more than 30 years. He has published many scholarly articles in national and international journals. He is presently engaged in capacity building through training of youths on modern farming techniques, production of improved planting materials and value addition. His present research focus is on crop growth and yield under photovoltaic systems in collaboration with the Institute of Bio-and Geosciences (IBG-2), Julich, Germany.

Biosynthesis of silver nanoparticles using aqueous extract of *Mitracarpus scaber* and evaluation of its analgesic property

T.I Adesipe

Federal Polytechnic, Nigeria

Pain is one of the most common reasons for seeking medical attention.The current study was aimed to evaluate the analgesic property of Silver nanoparticles (AgNPs) synthesized using aqueous extract of *Mitracarpus scaber*. AgNPs were synthesized from 1M $AgNO_3$ solution using aqueous extract of *Mitracarpus scaber* as a reducing as well as capping agent.Techniques including Field emission Scanning electron microscopy (FE-SEM), Transmission electron microscopy (TEM), UV-visible (UV-vis) spectroscopy, and Fourier Transform Infrared (FTIR) spectroscopy and X-ray diffraction analysis were used to analyze the synthesized AgNPs. Analgesic activity of different concentrations of the biosynthesized AgNPs was then determined using Acetic acid writhing and Hot plate tests. The result of the study revealed that biogenic AgNPs with an average diameter range of 5-10 nm were synthesized.The biogenic silver nanoparticles showed highest reduction of writhes and pain at the doses of 100 and 50 mg/kg b.w respectively which were significantly higher than the analgesic activity elicited by Diclofenac (50 mg/kg b.w) for both assays. The present work therefore concludes that biogenic silver nanoparticles using aqueous extract of *Mitracarpus scaber* has strong analgesic properties and could be utilized for the management of pain after proper pharmacological evaluations.

Table 1:Inhibition of pain threshold in hot plate test of mice by different treatments

Treatment	30 min	Reaction 60 min	Latency 90 min	(Seconds) 120min
Distilled water	3.00±0.60	10.67±0.90	5.33±0.90	8.33±0.90
A.AgNPs (50 mg/kg)	$30.33 \pm 5.18^{d\gamma}$ (90.11%)	25.00 ± 5.51^{b} (57.32%)	$30.33 \pm 2.73^{d\gamma}$ (82.43%)	24.33 ± 4.67^{c}(65.75 %)
A.AgNPs (100 mg/kg)	25.33 ± 5.33^{d} (88.16%)	17.00±3.61 (37.23%)	18.33 ± 2.40^{b} (70.92%)	17.00±2.80 (50.00 %)
A.AgNPs (200 mg/kg)	21.00 ± 2.65^{d} (85.71%)	22.00 ± 2.08^{a} (51.5%)	18.00 ± 2.00^{b} (70.38%)	20.00 ± 2.65^{a} (58.35 %)
Diclofenac (50 mg/kg)	16.67 ± 4.26^{a} (82.00 %)	15.33±1.45 (43.67 %)	15.67 ± 2.19^{a} (65.99 %)	17.00±1.0(51.00%)

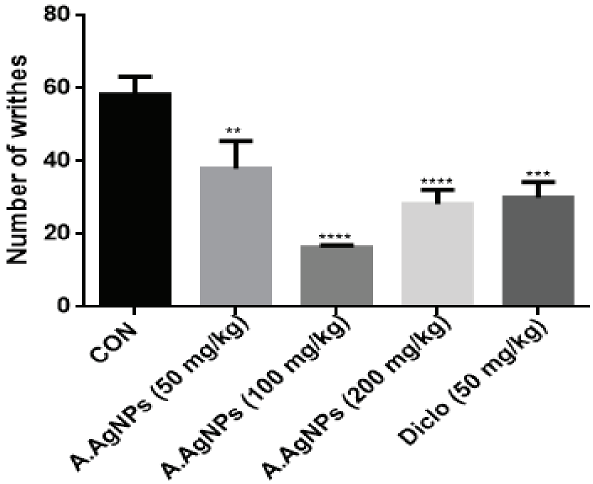

Figure 1: Effect of different doses of biosynthesized silver nanoparticles using aqueous extract of *Mitracarpus scaber* (A.AgNPs) in the acetic acid induced mouse writhing test. Bars represent mean ± SEM (n = 3). **P < 0.01, ***P <0 .001 significant reduction in writhing versus control.

Each value represent mean ±SEM (n = 3).aP < .05, bP < .01, cP < .001,d < .0001versus control; γP < .01 versus Diclofenac. Values in parenthesis indicate inhibition (% Inhibition of pain)

Biography

The author bagged her BSc. in Biochemistry from Ajayi Crowther University, Oyo State, Nigeria and her MSc. Also in Biochemistry at Covenant University, Ota, Nigeria in 2013 and 2016 respectively. She was employed as a lecturer III in the Department of Science Laboratory Technology (Biochemistry Unit), Federal Polytechnic Ilaro, Nigeria in 2016 and is currently a Lecturer I. She is undergoing her PhD programme at Covenant University, Ota, Nigeria.

Mathematical modelling of the chemical, physical and quality variations in *Cardaba* banana (*Musa acuminata* x *balbisiana* – ABB) during ripening

O.S. Jolayemi, O.R. Owoeye, A.M. Oluwole and **I.B. Oluwalana**

Federal University of Technology, Nigeria

Cardaba banana is considerably an underexploited cultivar in the tropics, and postharvest loss due to ripening is one of the mitigating factors against its food use. Hence, this study aimed at modeling the association between ripening stages and physicochemical and quality changes in the fruits. Linear, exponential, quadratic, and cubic regression analysis were tested for each parameter, the best-fitted models were compared and the best ones were reported in terms of their performance parameters such as regression coefficient (R^2) and error of predictions (SEP) were reported. Overall distinct nutritional characteristics of the fruits at every ripening stage was further elaborated using Principal Component Analysis (PCA). Amongst the physical, optical, and quality parameters, total soluble solid (°brix), weight loss, pulp ratio, acidity, and L*, a*, c*, b*, and ΔE color indices exhibited positive correlation ($R^2 \geq 0.93$; SEP = 0.20–2.02) with ripening, while firmness, peel ratio and hue were negative ($R^2 \geq 0.95$; SEP = 0.79–1.95). In the case of chemical compositions, all estimated parameters produced satisfactory results with high R^2 (0.94–0.98) and low SEP (0.01–2.19). Potassium, phosphorus, vitamin C, and calcium were among the micronutrients with good regression coefficients ($R^2 > 0.80$) versus ripening phase. PCA multivariate analysis further separated each banana ripening stage based on its most defining quality parameters. Depending on the intended food and industrial use, this study provides information on the ideal ripening stage that maximizes specific quality of the fruits. In addition, the research could be essential for forecasting *Cardaba* banana shelf life and eating quality.

Biography

Dr O.S. Jolayemi is a Senior Lecturer at the Department of Food Science and Technology whose teaching and research focus include but not limited to post-harvest quality evaluation of fresh fruits and vegetables, optimization of functional food formulations and processing conditions, techno-functional and structural characterization of foods, the relationship between structure and functionalities, the application of NIR, MIR, and UV-VIS technology in the food sector, especially for food authentication and process control, and the modeling of phenomena by use of Design of Experiments techniques and univariate and multivariate statistics.

Fire-retardant acrylic coating by silica-coated limestone (SCL) microencapsulation

E.M Madiebo, C.F Uzoh and **O.D Onukwuli**

Nnamdi Azikiwe University, Nigeria

Silica-coated limestone (SCL) microcapsule was synthesized and successfully introduced into acrylic resin to produce fire-retardant coatings. SCL microcapsules were prepared by encapsulating limestone granules with silica nanoparticles using epoxy resin as a binder. The morphology and the chemical composition of the SCL microcapsules were confirmed by scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR), respectively. The performance of SCL microcapsules on mechanical, flame retardant and thermal stability of the coatings was thoroughly investigated using FTIR, SEM, thermogravimetric analysis (TG), smoke density test, adhesion pull-off test, pendulum damping test and cone calorimeter test. The results shows that while the adhesion strength, pendulum hardness and limiting oxygen index (LOI) increased remarkably, the values of flame spread ratings (FSR), specific optical density (ODs), heat release rate (HRR), total heat release rate (THRR), smoke production rate (SPR) and total smoke production rate (SPR) decreased significantly with the introduction of SCL microcapsules. The TGA results confirm that incorporation of SCL microcapsules increases the thermal stability and boosts formation of large char layers. These results highlight the capacity of SCL microcapsules as efficient additives to improve the fire resistance and overall effectiveness of coatings.

Biography

Engr. Emeka Michael Madiebo, born in 1986, serves as a lecturer in the Department of Chemical Engineering at Nnamdi Azikiwe University, Awka, Nigeria. Possessing both M. Eng. and B.Eng. degrees in chemical engineering from Nnamdi Azikiwe University, Awka, and Enugu State University of Science and Technology, in 2010 and 2016 respectively, he brings a substantial academic background to his current role. With a wealth of experience gained as a research engineer at Hiyest Paints and Chemicals, Engr. Madiebo has cultivated expertise in material synthesis, processing, and characterization, advanced material processing, coatings, polymers, and composites.

Additionally, he holds the position of Deputy Director of Sustainable Bio-based Coating Materials and Microencapsulation at Nnamdi Azikiwe University. His extensive knowledge spans the design and optimization of processes and products for environmental applications, sustainable bio-based polymeric coating materials, waste minimization, and petroleum, petrochemical, and energy recovery.

Engr. Madiebo's academic journey includes teaching both theoretical and practical courses, supervision, and contributing editorial and reviewing services to esteemed journals. Passionate about advancing research in chemical engineering and material science and engineering, he has made significant contributions to the industry. Now, he eagerly seeks collaboration in related fields and is open to participating as a Ph.D. student, bringing a blend of practical experience and academic excellence to any international research initiative.

Influence of moringa oleifera leaf extracts on the structural and optical properties of chemically deposited Sb_2S_3 thin films

P. A. Nwofe[1], **E. Ogbaga**[1] and **P.E. Agbo**[2]

[1]*Department of Industrial Physics, Ebonyi State University, Nigeria*
[2]*Department of Industrial Physics, David Umahi Federal University of Health Sciences, Nigeria*

Thin films of antimony sulphide (Sb_2S_3) were grown on glass substrate using the chemical bath deposition method. The films were grown at varying concentrations of 0.1 M to 0.3 M while other deposition variables were fixed. A 4g/L of the Moringa Oleifera leaf extract was used as a dopant at the respective concentrations. Post-deposition heat treatments of the films was done using annealing temperatures ≤ 473 K for 60 mins. The structural properties of the films were investigated using X-ray diffractometry to study the crystalline structure and phases contained in the films. The transmittance, reflectance and absorbance with wavelength measurements in the UV-VIS region was done with the UV-spectrophotometry. Results of the structural analysis show that the grain size of the films increased with an increase in concentration (14.85nm, 22.45 nm, and 35.33 nm) in the doped films. The optical analysis indicates that the annealing treatments influenced the optical properties of the as-grown films to vary in one direction while the doped films varied in the reverse direction. The transmittances of the doped films were higher compared to that of the as-grown films. The energy bandgap of the doped films exhibited a blue shift effect with an increase in the concentration of the Sb^+ ions. The films show optical absorption coefficient > 104 cm^{-1} independent of the growth conditions. The value of the energy band gap falls within acceptable range for application in photovoltaic devices.

Biography

Professor Patrick Akata Nwofe was trained at the University of Nigeria where he obtained upper division in Physics and Astronomy in 2001. He proceeded on scholarship to Northumbria University, UK for his masters' degree in 2003 and passed with Master of Science with Commendation in Optoelectronic and Communications System. He was awarded a Ph.D studentship by Northumbria University and he passed successfully in three years without correction to his thesis in 2013. He was awarded the prestigious Matsuame International Foundation Postdoctoral Research Fellowship, Japan in 2019 and his contributions at Tokyo University of Science, Japan was published widely in reputable journals.

Professor Patrick Akata Nwofe joined Ebonyi State University in 2006, and rose to the rank of Professor in 2019. He has published widely in peer-reviewed journals, and presented research findings in reputable conferences (European Materials Research Society, IEEE Photovoltaic Specialists, Materials Research Society, etc).

A novel approach for ultrafast and highly sensitive carbon monoxide gas sensor based on PEDOT/GO nanocomposite

Maamon A. Frea[1] and **Hamed Y. Mohammed**[2]

[1]*Department of Physics, Ibb University, Yemen*
[2]*Department of Physics, Taiz University, Yemen*

An ultrafast and highly sensitive carbon monoxide gas sensor based on PEDOT/GO nanocomposites has been addressed in this work. A new approach was utilized to materialize PEDOT/GO via a straightforward and inexpensive polymerization in the presence of GO. Many characterization techniques, including FE-SEM, AFM, TGA, XRD, FTIR, Raman spectroscopy, and UV–Vis spectroscopy, have been utilized to confirm the successful formation of the PEDOT/GO nanocomposite. Moreover, the chemosensitivity modality has been used to measure the materials' resistivity and sensing performance. The PEDOT/GO-based sensor exhibits excellent sensitivity when exposed to a wide range of CO concentrations, from 20 ppm to 270 ppm. Our experimental outcomes demonstrated that incorporating PEDOT into GO enhanced the sensor sensitivity (from 16% for pure PEDOT to 44% for composite), which resulted in quick response/recovery times (43 s/42 s) and exceptional long-term stability at room temperature. Based on the results of this work, it seems likely that the proposed sensor, with its low cost, simple development process, and excellent sensing performance, could be a good candidate for real-time CO detection.

Biography

Maamon Omar Ahmed Farea is a Yemeni physicist and researcher with a passion for materials science and optoelectronics. Currently, he serving as a lecturer at Dr. Babasaheb Ambedkar Marathwada University in Chatrapati Sambhajinagar, India. Maamon's academic journey began with a Bachelor's degree in Physics from Ibb University, Yemen, followed by a Master's degree in Physics from Dr. Babasaheb Ambedkar Marathwada University in Chatrapati Sambhajinagar, India.

Driven by a thirst for knowledge, he pursued a Ph.D. in Material Science at Dr. Babasaheb Ambedkar Marathwada University, where he excelled in his research on fabricating gas sensors for detecting environmental pollutants using reduced graphene oxide and conducting polymers.

Apart from his academic achievements, Maamon actively participates in conferences and workshops to expand his knowledge and network with fellow researchers. With a strong desire to contribute to academia and inspire students.

Ionic liquid addition to the $MAPb_{0.5}Sn_{0.5}I_3$ perovskites: The properties and optoelectronic performance analysis using DFT calculations

Manala Tabu Mbumba

Department of Automotive & Mechanical Engineering, Faculty of Transport Engineering & Technology, National Institute of Technology, Tanzania

The presence of a Sn metal at high temperatures has a negative effect on the properties and performance of perovskites. This work investigates the effect of 1-butyl-3-methylimidazolium bromine ionic liquid in improving the characteristics of Pb-Sn halide perovskite alloys using density functional theory and CASTEP analysis. The results of the study show that the ionic liquid device outperforms the control sample in terms of electronic, optical, mechanical, and thermodynamic properties because it can reduce the perovskite film's grain boundaries and anchor the MA cation through hydrogen bonding, making it more tolerable at temperatures above 80°C. The photovoltaic properties of the ionic liquid perovskites were also enhanced when compared to the control device. The development of Pb-Sn alloys with improved properties made possible by this research will probably lead to the creation of stable and efficient lead-free perovskite solar cells.

Biography

Dr. Manala Tabu Mbumba was born and raised in Kagongwa by then a village located in Kahama District, United Republic of Tanzania, where he displayed remarkable intellect and determination from a youthful age. He pursued his higher education with a passion for engineering and renewable energy.

He first got his Bachelor's degree in Automobile Engineering from the National Institute of Transport (NIT), Dar Es Salaam-Tanzania in 2017. Building upon his engineering expertise, in the same year, he joined a Master of Science in Energy Engineering at the University of Dar es Salaam (UDSM), Dar Es Salaam-Tanzania and completed in 2019. Continuing to strive for excellence, Manala T. Mbumba then ventured abroad to North China Electric Power University in Beijing, China to pursue a PhD in Renewable Energy & Clean Power. His studies in China allowed him to gain a deeper understanding of renewable energy technologies and clean power solutions, positioning him as a leading expert in the field.

His current research interests include the thermal stability of halide Sn-based perovskites and properties improvement of mixed Pb-Sn halide perovskite materials for photovoltaic applications and it's from this he has so far published over 20 articles in different international and reputable journals.

Before coming to China, he was a government employee working with the National Institute of Transport as a Lecturer, lecturing students, carrying research and consultancy services in the areas of Renewable Energy Technology, Energy Conversions, Combustion and Power Systems, Refrigeration and Air Conditioning, Energy and Fuels and Thermal Engineering.

Apart from the government employment, Manala was implementing his vision to create positive change and contribute to the development of his country. He founded Flydream Company Limited, a venture that quickly gained prominence for its diverse range of services. Under his leadership, the company expanded rapidly, establishing itself as a major player in various sectors. The cleaning and fumigation services provided by Flydream played a crucial role in maintaining hygiene and public health standards. Their restaurants and catering services offered delightful culinary experiences, catering to diverse tastes. Moreover, Flydream's driving training program contributed to road safety and skilled drivers in the region. The microfinance services offered financial support to aspiring entrepreneurs and individuals in need, fostering economic growth at the grassroots level. The real estate division of the company facilitated the development of residential and commercial properties, enhancing urban infrastructure. Additionally, Flydream's general car services and repair division catered to the automotive needs of the public, ensuring reliable and efficient transportation solutions. The company's diverse portfolio demonstrated Dr. Manala T. Mbumba's ability to identify opportunities and address various societal needs.

In addition to his successful entrepreneurial endeavors, Manala T. Mbumba was actively involved in politics in Tanzania. He recognized the potential for policymakers to create an enabling environment for businesses and entrepreneurs to thrive. With his expertise in renewable energy and engineering, he advocated for sustainable policies and solutions to address environmental challenges faced by the nation. His passion for public service and dedication to the welfare of the people earned him respect and admiration from both citizens and fellow politicians.

Dr. Manala T. Mbumba's journey from being a student of engineering to a successful entrepreneur and politician serves as an inspiration to the youth of Tanzania and beyond. His commitment to renewable energy and clean power highlights the importance of sustainable development for the future of the planet. Through his multifaceted company, Flydream, he positively impacted various aspects of society, contributing to economic growth, job creation, and improved standards of living.

As a public figure, Dr. Manala remains dedicated to serving his country and continuing his mission to make a lasting impact on the lives of the people in Tanzania and beyond. His legacy is one of determination, innovation, and a relentless pursuit of excellence in various fields.

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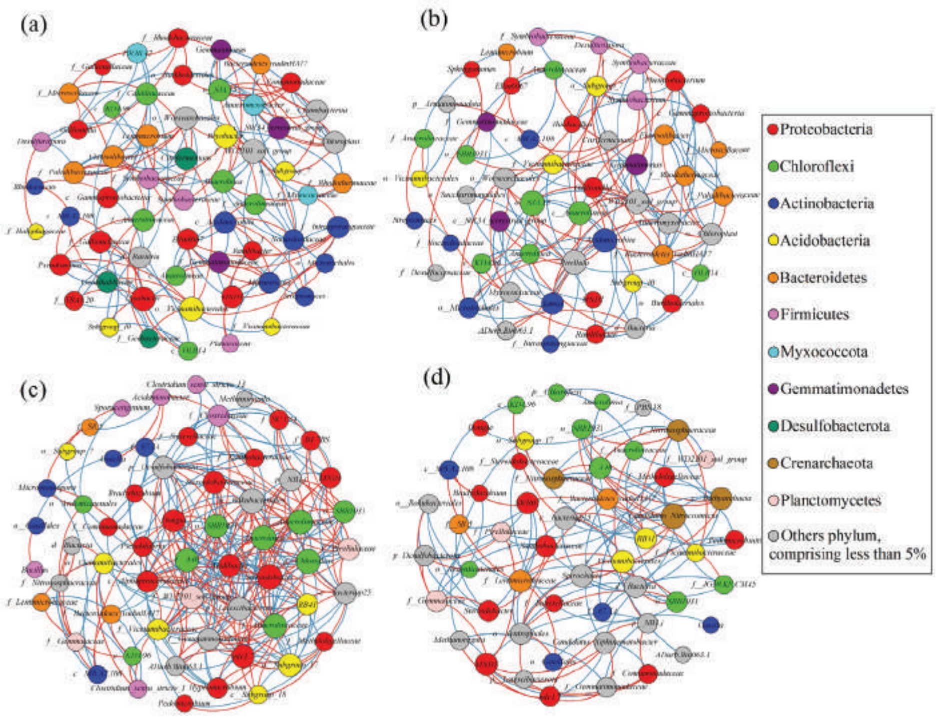
Impacts of Titanium dioxide nanoparticles on shifts and re-convergence of the bacterial community in superficial sediment *via* time

Salah Alden Alklaf[1,2], **Songhe Zhang**[1,2], **Jianzhong Zhu**[1,2], **Yu Ma**[1,2], **Benjamin Manirakiza**[1,2,3] and **Felix Gyawu Addo**[1,2]

[1]*Hohai University, China*
[2]*Hohai University, Nanjing, China*
[3]*University of Rwanda (UR), Rwanda*

Sediment is considered a sink for various emerging pollutants; however, the impacts of titanium dioxide nanoparticles (TiO_2 NPs) on the superficial sediment microbes remain unclear. In this study, bacterial communities and nutrients were investigated in surface sediments of mesocosmic wetlands exposed to 5 and 20 nm of TiO_2 NPs anatase and 600-1000 nm of bulk at 10 mg/L in overlying water for short (1 month) and long (6 months) terms exposure. TiO_2 NPs significantly increased DO and EC concentrations in superficial sediments compared to bulk and control treatments. TiO_2 NPs long-term exposure significantly decreased OTUs and Shannon values compared to bulk and control, and smaller nanoparticles via time exposure triggered the highest bacterial disruption by partitioning beta-diversity analysis. High-throughput sequencing revealed that Proteobacteria, Bacteroidetes, and Gemmatimonadetes phyla abundances increased significantly, whereas Chloroflexi and Actinobacteria decreased by 1.05% and 1.82% in the short-term and by 5.19% and 2.31% in the long-term compared to control. Long-term exposure to TiO_2 NPs significantly increased the abundance of Clostridia, Desulfuromonadia, Myxococcia, and Holophagae classes, but decreased the abundance of dominant genera f__*Anaerolineaceae* and o__*Vicinamibacterales*. Although TiO_2 NPs reduced the phenotypic traits such as anaerobic and gram (+/-) bacteria, the ternary plot revealed that the bacterial community was re-converged with prolonged exposure and acquired higher resistance mechanisms against TiO_2 NPs toxicity by increasing the abundance of Mobile-Genetic Elements (MGE) bacteria. However, Co-occurrence network analysis demonstrated that the intensity of interactions among bacterial genera was irreversibly impaired under TiO_2 NPs exposure and reflected the pseudo-re-convergence in the bacterial community over time. These data highlight that nano-size and exposure time have critical impacts on bacterial community shifts and re-convergence.



Co-occurrence networks of bacteria communities based on key genera in superficial sediments of bulk and control group (BCG, a and c) and TiO_2 NPs treatment groups (TNG, b, and d) after the short- (a and b) and long-term (c and d) exposures. The edges show strong Pearson's correlations (FDR-corrected P-values < 0.05). Blue or red edges indicated negative (Pearson's ρ < - 0.6) or positive (Pearson's ρ > 0.6) connections, respectively. Node size is based on the betweenness centrality scores of each genus.

Characterization of sediment bacteria community (16S rRNA) in experimental samples.

			Short -term			
Sample	OTUs	Sobs	Shannon	Simpson	Ace	Coverage
T0_M1	6508 ^{a}	4865^{a}	6.83^{a}	0.0034^{a}	5336^{a}	0.989
Tb_M1	6967 ^{b}	4548^{b}	6.997^{b}	0.0026^{b}	5434^{a}	0.983
TN20_M1	6992 ^{b}	4597^{b}	6.948^{b}	0.0030^{a}	5768^{b}	0.989
TN5_M1	7516 ^{c}	4848^{a}	7.066^{c}	0.0025^{b}	6241^{c}	0.987
			Long-term			
T0_ M6	7966^{a}	5541^{a}	7.455^{a}	0.0016^{a}	7229^{a}	0.969
Tb_ M6	7891^{b}	5456^{a}	7.392^{a}	0.0016^{a}	7181^{a}	0.968
TN20_ M6	7742^{c}	5299^{b}	7.210^{b}	0.0037^{b}	6977^{b}	0.969
TN5_ M6	7786^{d}	5278^{b}	7.283^{d}	0.0022^{c}	7004^{b}	0.966

Biography

A qualified doctoral graduate specializing in environmental science and engineering with a focus on microbiology and nanotoxicology in aquatic ecosystems, Hohai University, China. His Master’s degree in agricultural soil and water engineering is also from Hohai University. Bachelor’s degree in agricultural engineering from Aleppo University, Syria.

He was adept at utilizing basic and complex analyzing tools, with strong teamwork and scientific communication skills to conduct high-quality projects.

A strong believer in avoiding and controlling ecosystem pollution and agricultural development combined with new technology can recover ecological balance and solve social problems.

Working on Master's and PhD research has given his scope to develop and refine his teaching and research skills. Researchers often convey their aspirations for their Team’s Research Novelty and Development, and they agree and cooperate on a learning strategy so that their goals are fully achieved.

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Development of high strength large open porosity alumina ceramics using the sacrificial phase route: The role of the sacrificial phase fineness

Julian Alzukaimi and **Rafi Jabrah**

Higher Institute for Applied Sciences and Technology, Syria

In this work, porous alumina ceramics were prepared using sunflower seed husk powder mixed with PVA polymer as the pore-forming agent, and uniaxial pressing for green body formation. The effects of the pore-forming agent particles size, in addition to its content within the green ceramics, on shrinkage, porosity, microstructure and mechanical properties of the prepared product were investigated. Porous microstructure and pores morphology were characterized by SEM. Mechanical properties were evaluated in terms of the achieved porosity by measuring the flexural strength. Pore-forming agent ratios up to 51 wt%, in the green alumina, were considered, with two levels of particle size: fine (< 90 µm) and coarse (within 250-355 µm). Porous alumina ceramics, showing an open-pores microstructure, with porosities between 22 and 50 (74) vol%, and flexural strengths between 47 (4) and 186 MPa, along with pore size between 1 and 60 (220) µm, were obtained, when using the fine (coarse) particles, respectively. The mechanical reliability of the prepared alumina was discussed by analyzing the flexural strength data using Weibull statistics. The obtained product has potential applications for the filtration of hot and corrosive liquids and/or gases, thermal and electrical insulation, bioreactors and catalysts supports. Also, porous alumina with high mechanical properties may be beneficial as low weight structural and building materials and grinding tools. Sunflower seed shells have the benefits of being economical, eco-friendly and low in ash content, making them typical for the use as a porogen for the fabrication of porous ceramics using the sacrificial phase route and the conventional solid state processing. Two points to emphasize are: 1. the mechanical properties of porous ceramics depend not only on porosity, but on the pore size as well; and 2. a description of the mechanical behaviour of porous ceramics is not complete without mechanical reliability characterization.

Biography

Julian Alzukaimi, PhD in Applied physics. He studied engineering in HIAST (Higher Institute for Applied Sciences and Technology, Damascus, Syria) and graduated in 2000. He worked in NSCL (National Standards & Calibration Laboratory) until 2011. He obtained his Master degree from HIAST (in 2014) and PhD degree (in 2020) and he work there since 2016. He loves solving mathematical problems: so much! He also like studying physics and programing. Swimming is his favourite sport. Other hobbies include listening to music, playing the piano, watching movies, reading novels, writing and calligraphy.

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